UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

ACTION MEMORANDUM

DATE: May 3, 2006

SUBJECT: Action Memorandum for a Non-Time-Critical Removal Action at the Slip 4 Early Action Area of the Lower Duwamish Waterway Superfund Site, Seattle, Washington

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Superfund Project Manager

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Office of Regional Counsel

Site ID: CERCLIS ID – WA0002329803

I. PURPOSE

The purpose of this Action Memorandum is to document the U.S. Environmental Protection Agency's (EPA) approval of the non-time-critical removal action described herein for the Slip 4 Early Action Area of the Lower Duwamish Waterway (LDW) Superfund Site, Seattle, King County, Washington (Figure 1). The removal action for contaminated marine sediments and immediately adjacent bank areas at the Slip 4 Early Action Area (the "Slip 4 EAA" or "the site") will be conducted by the City of Seattle and King County pursuant to an EPA Settlement Agreement. The scope of the removal action addresses approximately 3.6 acres of sediments and banks (Figure 2).

Within the Slip 4 EAA, the chemical of concern (CoC) in the contaminated sediments is polychlorinated biphenyls (PCBs). Contaminated sediments with the highest PCB concentrations will be removed through dredging and excavation, and remaining sediments, which have lower concentrations, will be capped. Contaminated sediments and soils from adjacent bank areas along the eastern portion of the slip will be excavated, and these bank areas will be sloped to accommodate placement of engineered slope caps. Removed sediments and soils from bank areas will be disposed at an off-site upland commercial disposal facility. Asphalt, creosote-treated timbers and piles, and other debris present in sediments will be removed, as necessary, for implementation of the removal action. Substantial sediment accumulations that extend from Slip 4 up into the lowest outfall segment of the Georgetown flume will be removed or otherwise contained to eliminate the potential for recontamination of sediments in Slip 4.

The primary removal action objective for sediments in the Slip 4 EAA is to reduce the concentrations of contaminants in post-cleanup surface sediments [biologically active zone (0-10 cm)] to below the Washington State Sediment Quality Standards (SQS) for PCBs and other chemicals of interest.

By approval of this memorandum, EPA Region 10 determines that: 1) the conditions at the site may present an imminent and substantial endangerment to public health, or welfare, or the environment; and 2) the site conditions meet the criteria of the National Contingency Plan (NCP), 40 CFR Section 300.415, for a removal action. The removal action is required for immediate reduction of the risk to the public and the environment from uncontrolled hazardous substances at the Slip 4 EAA. An administrative record has been prepared for this removal action. No obligation of funds is necessary as this action will be conducted by the City of Seattle and King County under an EPA Settlement Agreement.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

This is a non-time-critical removal action at the Slip 4 EAA within the boundaries of the LDW Superfund Site in Seattle, WA (see Figure 1). The Slip 4 EAA has been identified by the EPA and the Washington State Department of Ecology (Ecology) as a candidate area for early cleanup because sediments in these areas are associated with greater ecological and/or human health risk. The LDW Site was listed on the National Priorities List (NPL), pursuant to Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 9605, on September 13, 2001. The CERCLIS ID number is WA0002329803.

The key parties involved in the LDW Site are the Lower Duwamish Waterway Group (LDWG) (composed of the City of Seattle, King County, the Port of Seattle, and The Boeing Company), EPA, and Ecology. The LDWG is conducting the LDW Remedial Investigation and Feasibility Study under an Administrative Order on Consent (AOC) with EPA and Ecology. Pursuant to the LDWG AOC and Tasks 9 and 10 of the Statement of Work, and under EPA and Ecology oversight, the City of Seattle and King County performed the site characterization, environmental investigations, and the Engineering Evaluation/Cost Analysis (EE/CA) for the Slip 4 EAA.

1. Removal Site Evaluation

Slip 4 is located on the east bank of the LDW, approximately 2.8 miles from the southern end of Harbor Island. Slip 4 was created in the early 1900s during filling and channelization of the Duwamish River. The slip itself is an arc-shaped remnant of a former Duwamish River meander. The slip encompasses approximately 6.4 acres and is approximately 1,400 feet long, with an average width of 200 feet. The slip is relatively shallow, ranging from +5 ft mean lower low water (MLLW) at the head of the slip to approximately -20 feet MLLW at the mouth. Properties immediately adjacent to Slip 4 are currently owned by Crowley Marine Services (Crowley), First South Properties, King County, and The Boeing Company. Crowley owns the majority of the submerged land (i.e., sediments) within the Slip 4 EAA and the bank along the First South Properties' shoreline.

Since its creation, aquatic land uses in Slip 4 have included log storage and shipping activity. Beginning in approximately the 1930s, land uses along the slip included a sawmill, lumber yard, hydraulic equipment manufacturing, machine shop, lime plant, and asphalt plant. Airplane manufacturing adjacent to Slip 4 began sometime before 1960. Current land uses include a pier and berthing facility used for cargo, shipping and other navigational activities; adjacent upland property occupied by Emerald Services for storage of portable toilets, storage tanks and containers, and dumpsters; and, adjacent upland property owned by Boeing that houses the Integrated Aircraft Systems Laboratory, as well as a public walking trail and park.

Slip 4 receives stormwater from five public outfalls that discharge to the head of Slip 4, and from numerous private storm drains and a swale located along the Slip 4 shoreline (see Figure 2). The drainage basin that discharges to Slip 4 currently covers about 467 acres. Within the basin, land use is primarily industrial/commercial, with a small amount of residential property. There are currently no direct industrial discharges to Slip 4. Non-point discharges to Slip 4 include stormwater runoff that is not collected in a piped system and discharges directly to the slip as sheet flow.

Numerous historical environmental investigations of sediments in Slip 4 have been performed. Four sediment investigations were conducted between 1990 and 1999. Additional

sediment and bank soil characterization data were collected in 2004 and 2005. Previous upland investigations adjacent to Slip 4 have included soil and groundwater investigations. Based on these studies, the primary contaminant of concern in sediments in Slip 4 is PCBs. These investigations and results are described in detail in the EE/CA and in subsequent sections of this Action Memorandum.

Historical sources of releases of PCBs to the Slip 4 sediments include commercial and industrial releases. Potential sources include a Seattle City Light facility that discharged stormwater runoff and cooling water to Slip 4 via the Georgetown Steam Plant flume; The Boeing Company Plant 2 area immediately adjacent to Slip 4, the North Boeing Field, and the King County International Airport (a/k/a Boeing Field) that discharged stormwater runoff and industrial wastewater to the slip via storm drains; and erosion of contaminated soils from banks along Slip 4.

These past releases are the primary source of contaminants in Slip 4 sediments that are subject to this removal action. However, ongoing releases of PCBs to Slip 4 from stormwater drainage have been identified, and these releases pose a recontamination pathway of potential concern. The sources of these PCB releases continue to be investigated and EPA will ensure that these sources are adequately controlled prior to construction of the Slip 4 removal action to minimize the potential for recontamination of Slip 4 sediments.

2. Physical Location

The Slip 4 EAA is on the east bank of the Duwamish River, south of downtown Seattle, Washington. Slip 4 is located in a primarily industrial and commercial area; a small residential neighborhood is located about 0.25 mile from the slip. There is a small park on the southeastern side of Slip 4. Slip 4 is currently used for navigation, with tugs and barges operating and docking along the middle and outer berths in Slip 4. Possible recreational activities within and near the slip include kayaking, canoeing, and motor boating. Commercial and tribal fishing occur within and near the Duwamish River. The Muckleshoot Tribe has federally recognized treaty rights in the vicinity of Slip 4. Tribal Usual and Accustomed fishing areas recognize commercial, subsistence, and ceremonial tribal fishing rights.

Nearly all of the Slip 4 shoreline has been highly modified and includes berths and a pier, riprap, exposed geotextile material, bulkheads, and miscellaneous fill. The small areas of unarmored shoreline are generally steep, eroded slopes, vegetated by mixed grasses and shrubs.

3. Site Characteristics

The removal action addresses contaminated estuarine sediments within the Slip 4 EAA, as well as adjoining banks that are potential sources of PCB contamination to the sediments. The

boundaries of the removal action are shown in Figure 2. During design, some adjustments may be made to the boundary based on predesign sampling results. Contaminants detected, concentrations, sediment quality guidelines, and site conditions are described below, and site exposure and associated risk are described in Section III.

4. Release or threatened release into the environment of a hazardous substance, or pollutant, or contaminant

The portion of Slip 4 that will be addressed by the removal action primarily consists of approximately 3.6 acres of contaminated estuarine sediments. The contaminant of concern is PCBs. This contaminant is a "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

In the Slip 4 EAA, the 2004 sediment investigations show PCB concentrations in surface sediments ranging from 0.2 parts per million dry weight (ppm dw) to 5.1 ppm dw, and in subsurface sediments ranging from undetected to 17 ppm dw (excludes one outlier). The 2004 PCB concentrations in surface sediments in most areas of the slip are less than they were for data collected between 1990 and 1998. These decreasing PCB concentrations in surface sediments over time and throughout the slip may be the result of reduced PCB input due to source control, and physical processes consistent with natural recovery of sediments within Slip 4.

Actions to address PCBs will also address the other contaminants found in sediments at some stations in the Slip 4 EAA. The other contaminants that exceed promulgated standards are bis(2-ethylhexyl)phthalate, phenol, and indeno(1,2,3-c,d) pyrene. Concentrations and analysis of contaminants in the Slip 4 sediments are described in the EE/CA. The primary sources of these contaminants are from upland facilities and uses that released the substances into the river. Based on current upland source control efforts, significant upland sources have been controlled or will be by the time the removal action is completed.

The presence of hazardous substances at the site, or the past, present, or potential migration of hazardous substances currently located at or emanating from the site, constitute actual and/or threatened "releases" as defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22). Section III of this Action Memorandum provides a discussion of potential exposure and risk to site receptors.

5. NPL status

The Slip 4 EAA is located within the boundaries of the Lower Duwamish Waterway Superfund site, which was listed on the NPL on September 13, 2001.

6. Maps, pictures, and other graphic representations

Relevant figures are attached to this memorandum.

B. Other Actions

1. Previous actions

There have been no previous CERCLA removal actions or sediment cleanup activities in Slip 4. However, sediments in the slip have been dredged for navigation purposes. Dredging events are known to have occurred in 1981 and 1996 when sediments on the west side of the slip were removed (see Section 2.1.2 of the EE/CA). The 1981 dredging event included dredging of sediments from within a portion of the area now designated as the Slip 4 EAA.

2. Current actions

There are no other removal actions associated with the Slip 4 EAA.

As the lead agency for LDW source control, Ecology is currently performing upland source control work under state authorities. Consistent with the Source Control Strategy for the LDW Site, Ecology issued a draft Source Control Action Plan for the Slip 4 EAA on April 6, 2006. The Action Plan is currently being revised in response to public comment.

Potential sources of post-removal recontamination have been considered during the EE/CA evaluation of alternatives. Potentially significant upland sources of recontamination, particularly for PCBs, identified for Slip 4 are continued erosion of bank material and contaminant loading from storm drains. Because some bank material is a potential source of recontamination to Slip 4 sediments, actions to stabilize and contain these banks are included as part of this removal action. No Ecology-led upland cleanup actions are currently planned in association with source control actions related to the Slip 4 EAA. Contaminant loading from storm drains is being addressed through source control actions that are currently being implemented (e.g., drain cleaning, source tracing) and will continue, along with further investigation and monitoring. Sediment cleanup will not be implemented until adequate source control efforts have been implemented to minimize the potential for sediment recontamination.

C. State and Local Authorities

1. State and local actions to date

The LDW is a joint-lead site with Ecology. The LDW RI/FS is currently being prepared.

Ecology has participated in reviewing and commenting on all documents, briefings, and public meetings associated with the Slip 4 removal action. Other stakeholders that were provided an opportunity to participate included the Duwamish River Cleanup Coalition, Waste Action Project, Muckleshoot Tribe, Suquamish Tribe, Washington State (Department of Ecology as trustee), Washington Department of Fish and Wildlife, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, and Washington Department of Health.

2. Potential for continued State/local response

The removal action at the Slip 4 EAA will be conducted by the City of Seattle and King County under CERCLA authority, with the state being given the opportunity to provide timely comments on project design documents and work plans. Coordination efforts with state and local authorities will continue throughout the project.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Consistent with EPA guidance for conducting an EE/CA, a streamlined risk evaluation was conducted for the Slip 4 EAA (Section 2.4 of the EE/CA). The streamlined risk evaluation addresses risk only from exposure to contaminated sediments in the absence of a removal action.

Areas in the LDW outside of the Slip 4 removal action boundary will continue to be evaluated under the LDW RI/FS. The LDW RI/FS will include a baseline ecological and human health risk assessment to evaluate potential risks to human health and the environment posed by contaminated sediments throughout the entire LDW Site.

A. Threats to Public Health or Welfare

At the Slip 4 EAA, potential exposure pathways for human health risks include direct contact with sediment during netfishing or beach play and ingestion of fish or shellfish that are in contact with sediment or that have fed on prey that reside within the sediment. The contaminant of concern for Slip 4 sediments is PCBs. PCBs are a known human carcinogen and are also known to accumulate in the tissue of fish and shellfish.

Human health risks specific to PCBs in sediments in the Slip 4 EAA have not been calculated; however, risks to human health from sediments were evaluated in the context of the results from the overall LDW Site via the Phase 1 Human Health Risk Assessment (see Section 2.4.2.2 of the EE/CA). Specifically, sediment concentrations were compared to human health risk-based screening concentrations protective of direct sediment contact for individuals engaged in netfishing or beach play activities. Results indicate that PCBs are the primary risk driver for

these two exposure pathways in Slip 4. Only two other chemicals (arsenic and lead) exceed the risk-based screening concentrations, and each of these is exceeded at only one station. Also, PCBs found in Slip 4 sediments likely contribute to potential unacceptable risks throughout the LDW to humans through ingestion of contaminated fish or shellfish.

Based on the concentrations detected in sediments at the site and the potential direct and indirect exposure pathways identified, EPA has determined that a removal action is required to mitigate impacts to public health, or welfare, or the environment. The removal action will eliminate the exposure pathways to PCBs in sediments within the removal area, which will lower unacceptable risks to human users of Slip 4 and site-wide excess risks to users of the entire site for seafood collection.

B. Threats to the Environment

Ecological receptors include benthic organisms, fish, birds, and mammals. Potential exposure pathways for benthic organisms include direct contact with contaminated sediment, and ingestion of contaminated sediment. The primary potential exposure pathway for fish, birds, and mammals is ingestion of marine organisms. Bottomfish may have additional exposure due to direct contact with or ingestion of contaminated sediment. PCBs are known to adversely affect aquatic biota.

Ecological risk to benthic communities in Slip 4 was evaluated through comparison with the Washington State Sediment Management Standard (SMS) numerical chemical concentration criteria. The SMS numerical criteria are considered protective of benthic organisms and are comprised of the sediment quality standard (SQS) and the cleanup screening level (CSL). Concentrations of contaminants equal to or less than the SQS are unlikely to have adverse effects on biological resources in Puget Sound marine sediments. An exceedance of the SQS numerical criteria indicates the potential for minor adverse biological effects or toxicity. The CSL is greater than or equal to the SQS and represents a higher likelihood of risk to benthic organisms than SQS levels. For total PCBs, the SQS is 12 ppm-carbon normalized and the CSL is 65 ppm-carbon normalized.

Surface (0-10 cm) sediment chemistry data from Slip 4 were used to estimate risks to benthic infauna. In 2004, PCB concentrations exceeded the CSL at three of 29 sample locations and in the intertidal composite sample. Total PCB concentrations at these three sample locations ranged from 103 to 148 ppm-carbon normalized, and the intertidal composite sample showed 154 ppm-carbon normalized. On a dry-weight basis, these concentrations range from 1.7 to 5.1 ppm. PCB concentrations at six additional sampling locations exceeded the SQS. The only other detected chemicals that exceeded the SQS or CSL in the 2004 surface samples were BEHP, phenol, and indeno[1,2,3-c,d]pyrene. CSL exceedances of these three chemicals are included within the removal area. Thus, surface sediments within the removal area exceed SMS

standards, indicating that these sediments may pose a risk to benthic community health if no cleanup action is taken.

Risks to other potential ecological receptors in Slip 4 were not quantitatively evaluated; however, birds, fish, and mammals are mobile and could be exposed to chemicals in sediment throughout the LDW, including Slip 4.

Threatened and endangered species potentially occurring within the local area include Chinook salmon, bull trout, and bald eagle.

Based on the PCB concentrations detected in sediments at the site (and exceedances of the SMS), and known or potential ecological pathways identified, EPA has determined that a removal action is required to reduce potential impacts to the environment.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

This non-time-critical removal action at the Slip 4 EAA will be implemented by the City of Seattle and King County. In general, the contaminated sediment with the highest PCB concentrations will be removed, and remaining sediments, which have lower concentrations, will be capped. Through an evaluation of effectiveness, implementability, and costs, the proposed action (Alternative 2 in the EE/CA) was selected as the preferred alternative. The selection of this alternative was not revised in response to public comment.

1. Proposed action description

The proposed actions include a combination of excavating, dredging, and capping of sediments in the slip and in immediately adjacent bank areas; institutional controls; and long-term monitoring to achieve the objectives of the removal action within the approximately 3.6 acre Slip 4 Early Action Area (Figure 3). The actions include:

- Removal of contaminated sediments with disposal at an off-site upland commercial disposal facility, followed by capping of remaining sediments, as detailed below:

- Dredge approximately 4,300 cy of contaminated sediment from the Slip 4 EAA (as shown in Figures 5-6 through 5-9 of the EE/CA). This dredging generally targets the near-surface material with the highest concentrations of contaminants.

- Excavate approximately 9,700 cy of bank material along the shore of the Slip 4 (in Zones 2, 3, 4, and 5 as shown in Figure 2; bank material is estimated to consist of approximately 6,800 cy sediment and 2,900 cy soil). Excavations in Zones 2 and 3 (covering approximately 250 feet of shoreline) will be extended landward to expand intertidal habitat, creating a shallower slope and approximately 0.08 acres of new aquatic habitat from existing uplands.

- Place engineered sediment caps throughout the entire 3.6 acre removal action area to physically and chemically isolate contaminated sediments not removed by dredging or excavation (as shown in Figures 5-6 through 5-9 of the EE/CA). Specific cap configurations will be determined during design, in consideration of federal guidance, protection of Native American shellfishing treaty rights, and habitat type and functions. All dredged or excavated areas will be capped.

- Place engineered slope caps on the eastern shore of Slip 4 (Zones 3, 4, and 5 as shown in Figure 2). Improve conditions of bank areas in preparation for capping (including improving slope stability, removing debris and failing bulkheads, and preparing a subgrade for cap placement). Post-removal samples would be collected on exposed surfaces to document the nature of the material beneath the cap. It is possible that the action would remove all contaminated material, in which case the final cap may require a lesser degree of long-term monitoring and maintenance. Place slope cover in Zone 2 for slope stabilization (based on existing data, potential contaminant source materials have not been identified in Zone 2).

- Dispose of excavated and dredged material in a landfill that meets state and federal requirements for disposal of such materials.

- To accommodate these actions, the City of Seattle will proceed with negotiations for a purchase and sale agreement with Crowley Maritime for the land owned by Crowley and subject to this action. The negotiations may include a lot line adjustment in the under-pier area so that no capped areas would remain in Crowley's ownership.

- To accommodate these actions, a portion of the existing Crowley pier may be removed from within the removal action area. During project design, the City of Seattle and King County will evaluate the most feasible approach to remediate the

under-pier area and to implement long-term maintenance of that remedy. The evaluation will include consideration of effectiveness, implementability, cost, and habitat functions.

- Removal of asphalt, creosote-treated timbers and piles, and other debris present in sediments within the removal action area (estimated 500 tons).

- Sediment accumulations currently present within the lowest segment of the Georgetown flume (approximately 370 feet of the flume upgradient from the outfall itself) will be assessed during predesign investigations. Accumulated sediments that have the potential to recontaminate Slip 4 will be removed either as part of this removal action or as a separate action by the City of Seattle. Modifications or upgrades to the Georgetown flume outfall structure may also be necessary as part of this removal action to ensure proper function of the outfall structure (i.e., free-draining at a low tide), since it is currently at a lower elevation than the sediments immediately adjacent to the outfall. Alternatives include designing the cap to accommodate the existing outfall structure, raising the elevation of the outfall structure, and abandoning the outfall structure.

- Implementation of institutional controls.

  - Institutional controls will be required because some hazardous substances will remain on-site at levels that do not allow unlimited use and unrestricted exposure in bank slopes and intertidal and subtidal sediment areas. An Institutional Control Implementation Plan and a final Institutional Control Implementation Report will be prepared. The specific objectives of the institutional controls are to:

    - Prevent any uncontrolled excavation or construction that may compromise the cap integrity;
    - Prevent any current or future land and waterway uses that could compromise the cap integrity;
    - Require notification of the state and EPA prior to development actions at the site that may damage the cap;
    - Ensure that these restrictions will run with the land.

  - Institutional controls will not preclude the Muckleshoot Tribe from exercising treaty-protected fishing activities in the removal action area in the future.

- Performance of long-term monitoring and reporting.

  - Long-term monitoring and reporting will be performed. The primary purpose of this monitoring is to ensure that the site remains protective of human health and

the environment. A Long-Term Monitoring and Reporting Plan will be developed to specify monitoring activities and frequencies of monitoring events, the responsible party for performing each activity, and the process to be followed for addressing any contingency or corrective actions.

2. Contribution to remedial performance

The Slip 4 EAA is located within the boundaries of the LDW Superfund Site. The LDW Record of Decision is expected after the completion of the Slip 4 non-time-critical removal action. Due to the number of years remaining to select and implement a remedy river-wide, this removal action is designed to immediately address contaminated sediments within the Slip 4 EAA, and reduce exposure to receptors to concentrations of chemicals that likely would require response action under any future remedial alternative. This removal action will contribute to the efficient performance of the anticipated long-term remedial action for the LDW Site with respect to the release concerned.

3. Description of alternative technologies

Candidate technologies for sediment remediation were identified and screened prior to developing alternatives for further engineering analysis. General categories of removal action technologies considered at the screening stage included: no action, institutional controls, monitored natural recovery and enhanced natural recovery (MNR/ENR), removal, containment, treatment, and disposal. Each of these candidate technologies were evaluated based on effectiveness, implementability, and cost. Technologies were eliminated from further consideration due to low expected technical feasibility or effectiveness. Technologies that were not cost-effective relative to other equally-protective options were also not retained. Technologies determined to be potentially applicable to the Slip 4 removal action included institutional controls, MNR/ENR, removal, containment, and disposal.

4. Engineering Evaluation/Cost Analysis (EE/CA)

EPA prepared an EE/CA Approval Memorandum (June 15, 2004) for this removal action.

Under EPA oversight, the City of Seattle and King County prepared the EE/CA, which documents the development and evaluation of removal action alternatives and discusses the rationale for the recommended alternative. The EE/CA was finalized on February 10, 2006, and a copy of the Executive Summary of the EE/CA is provided in Attachment A. A 30-day public comment period on the EE/CA was held, and EPA prepared a response to public comments (Attachment B).

5. Applicable or relevant and appropriate requirements (ARARs)

For on-site activities, all state and federal ARARs will be complied with to the extent practicable. A comprehensive list of ARARs for the removal action is provided in Table 6-1 of the EE/CA and reproduced herein in Attachment C. Primary federal ARARs for the removal are the Clean Water Act Sections 401 and 404; Endangered Species Act; and Section 10 of the Rivers and Harbors Act. Primary state ARARs are the Washington State Sediment Management Standards and the Washington Hydraulics Code.

EPA is preparing a Biological Assessment that evaluates the potential effects on threatened and endangered species from this removal action. EPA will consult with NOAA Fisheries and the U.S. Fish and Wildlife Service.

EPA prepared an evaluation of Essential Fish Habitat (EFH) and concluded that this proposed action is not likely to adversely affect EFH for salmonid and groundfish. A copy of EPA's evaluation was provided to NOAA Fisheries.

Off-site activities will comply with all applicable local, state, and federal laws, including the Off-Site Disposal Rule (40 CFR 300.440).

6. Project schedule

The project schedule for the Slip 4 EAA will be set forth in the EPA Settlement Agreement Statement of Work for this removal action. The construction phase of this project is currently scheduled for October 2007 through February or March 2008.

B. Estimated Costs

The removal action is being implemented by the City of Seattle and King County. The projected costs to implement this non-time-critical removal action are estimated at $6.9 million (see Table 5-3 of the EE/CA).

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If the action is delayed or not taken, contamination will continue to adversely affect the environment at levels exceeding probable effect concentrations. Delayed action will increase environmental risks through prolonged exposure to contaminants present in the sediments.

VII. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues at this site.

VIII. COMMUNITY RELATIONS

The EE/CA for this removal action was available for public review and comment from February 17 through March 18, 2006. Notice of this comment period was published in the *Seattle Times* and *El Mundo* at the start of the 30-day public comment period. Notice of this public comment period was also announced in the February 24, 2006 edition of the Washington Department of Ecology's *Site Register* and by postcards in English and Spanish. Notice of the comment period, public meeting, and a summary of the proposed EE/CA alternatives were described in a Slip 4 Fact Sheet (February 2006) that was mailed to approximately 950 addresses. Fact sheets in Spanish (about 400) were also distributed. Announcements were also placed on EPA's website and the EPA web calendar. Public outreach was also performed by the Duwamish River Cleanup Coalition, EPA's Community Advisory Group for the site.

EPA held a public meeting in the Georgetown neighborhood on March 7, 2006. The meeting was attended by approximately 120 people. Public comments were recorded by a court reporter.

EPA received eight comment letters and comment forms during the public comment period, and fourteen individuals provided spoken comment at the public meeting. Responses to all significant comments are provided in the Responsiveness Summary (Attachment B).

An Administrative Record was prepared for this action and notice of availability of that record was published in the above-referenced newspapers and the Superfund Fact Sheet. The Administrative Record was available at EPA, and copies of key documents were made available at the Georgetown information repository, on the EPA web site for the Lower Duwamish Waterway, and via CD-ROM.

Since the initiation of the Slip 4 early action in 2003, EPA has provided stakeholders with the opportunity to review and provide input on all draft documents for the Slip 4 EAA and has held milestone briefings with stakeholders at key points in the process. EPA also participated in routine quarterly meetings with the Duwamish River Cleanup Coalition and other stakeholders to provide updates on site-wide LDW activities, including the Slip 4 EAA.

IX. ENFORCEMENT

This removal action should be implemented by the City of Seattle and King County, pursuant to an Administrative Settlement Agreement and Order on Consent for Removal Action

(Settlement Agreement). The Settlement Agreement is currently being negotiated. The Settlement Agreement describes the work to be performed for the removal action, including preparation and submittal of project design and removal action documents, implementation of the removal action, submittal of a Removal Action Completion Report and Institutional Control Implementation Report, and submittal of a Long-Term Monitoring and Reporting Plan to ensure that the removal action objectives are achieved at the site.

X. RECOMMENDATION

This decision document represents the selected removal action for the Slip 4 EAA, located within the boundaries of the Lower Duwamish Waterway Superfund Site, Seattle, Washington, developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the site.

Conditions at the site meet the NCP Section 300.415(b)(2) criteria for a removal and I recommend your approval of the proposed removal action. None of the removal project costs come from the Regional Removal allowance. Your approval or disapproval should be indicated below.

Approve: _____ Date: 5-5-2006

Disapprove: _____ Date: _____

List of Figures and Attachments

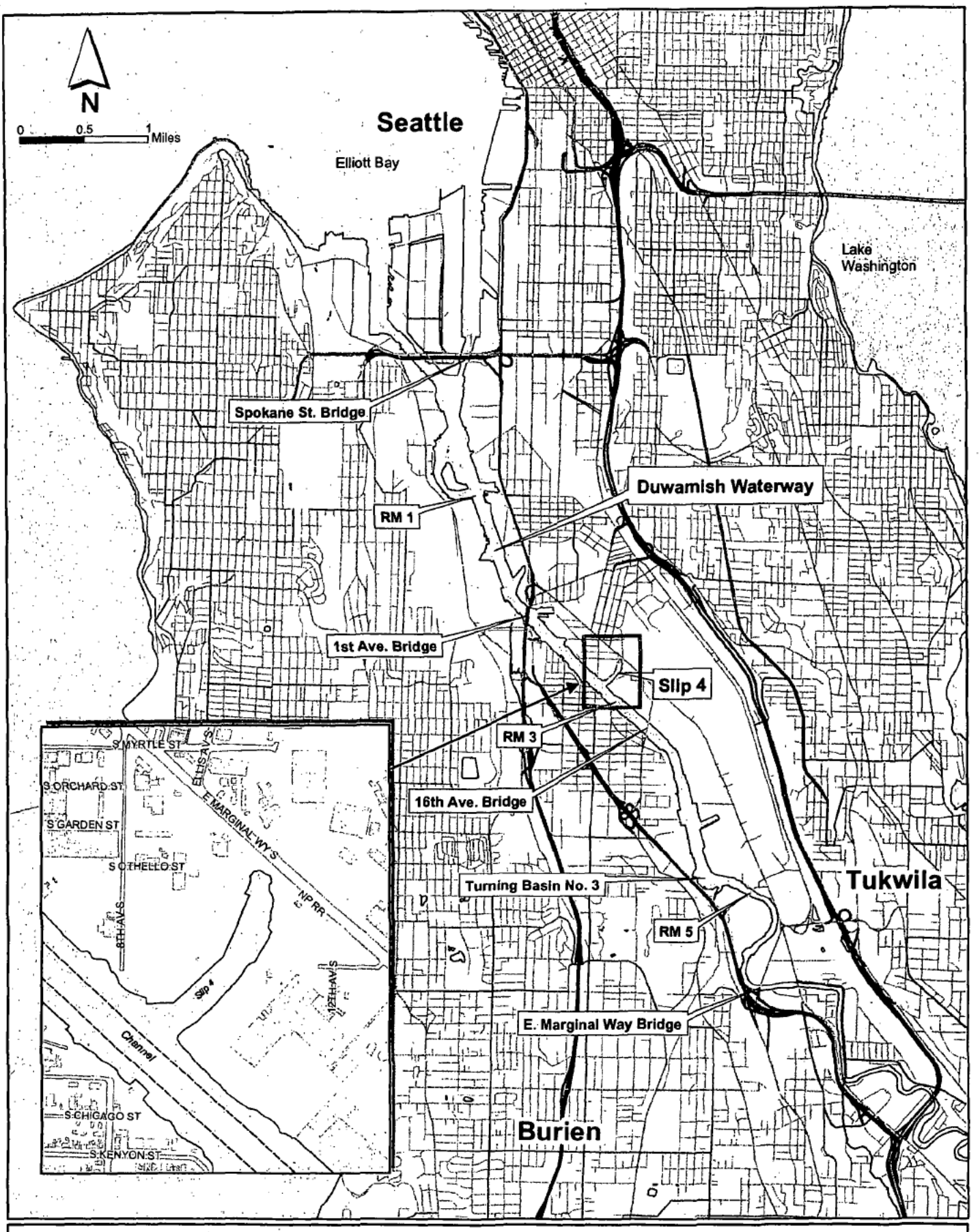
Figures

Figure 1	Vicinity Map (Figure 1-1 from the EE/CA)
Figure 2	Slip 4 Removal Boundary (Figure 2-18 from the EE/CA)
Figure 3	Selected Alternative - Alternative 2 from the EE/CA (Figure 5-6 from the EE/CA)

Attachments

Attachment A	Executive Summary for the Engineering Evaluation/Cost Analysis, Slip 4 Early Action Area
Attachment B	Responsiveness Summary for Public Comments on the Engineering Evaluation/Cost Analysis, Slip 4 Removal Action
Attachment C	ARARs (Table 6-1 from the EE/CA)

Figures

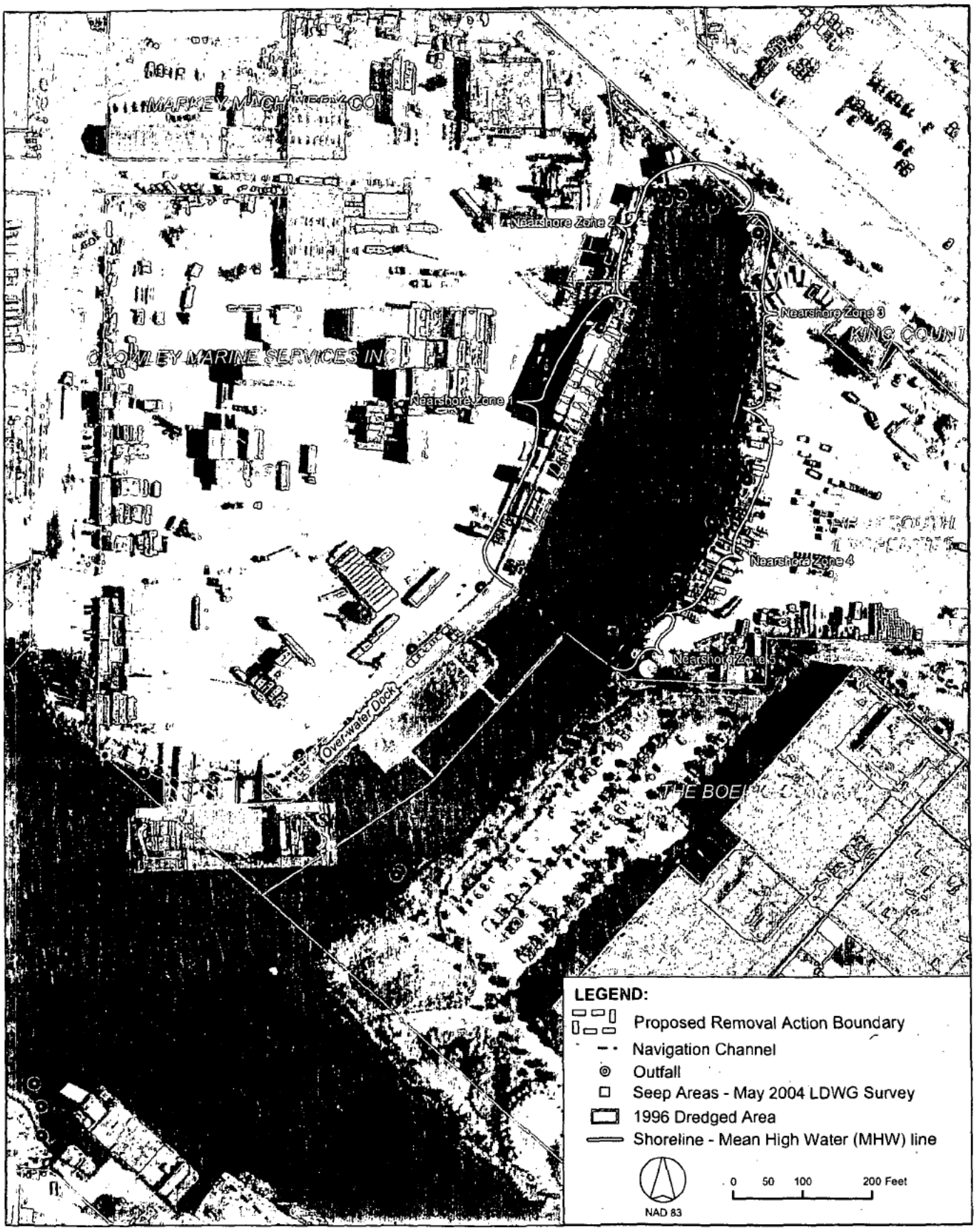


integral consulting inc

Map Feature Sources: King County GIS, Seattle Public Utilities, USACE, Ecology, and others.
Plot date: 1/15/2004

Figure 1-1
Vicinity Map
Slip 4 EE/CA

Figure 1



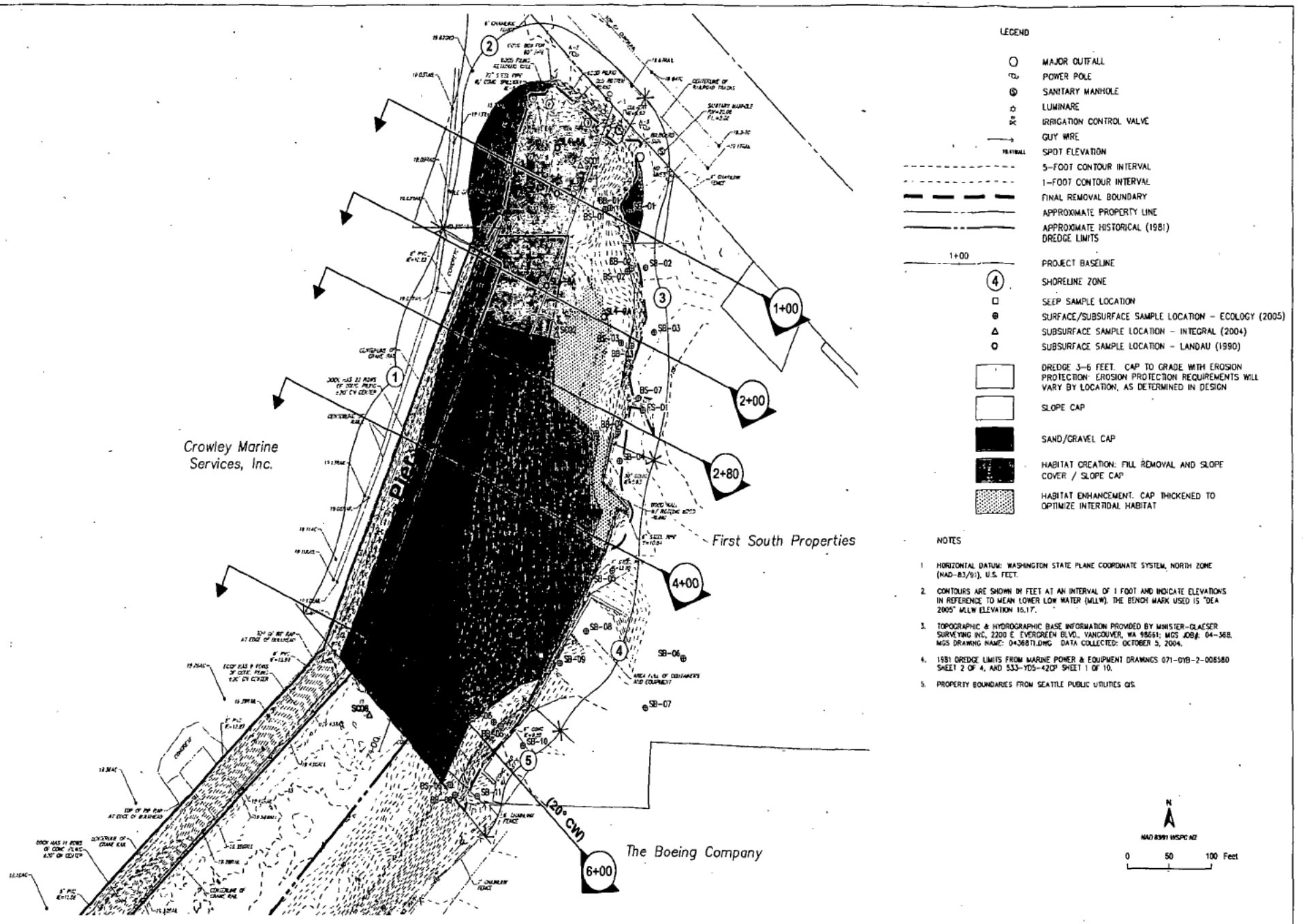
Map Document: (O:\Projects\Duwamish_OLY\Projects\Slip4_EECA\Figure_2-17_Slip4_2004_Clean-up_Boundary_Map_Astle mxd)
1/13/2006 -- 2:52:46 PM

integral consulting inc.

Map Feature Sources:
King County GIS, Seattle Public Utilities,
USACE, Ecology, Windward Environmental,
David Evans, Inc., and others
Sediment Chemistry:
Lower Duwamish Project Database and 2004
Slip 4 Survey PCB analysis results

Figure 2-18
Slip 4 - EE/CA
Slip 4 Preliminary
Removal Action Boundary

Figure 4



Map Document: (FG-Cross Sections.dwg) - Layout: Alt 2 - KBec Loc. Plan
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integral consulting inc.

Figure 5-6
Cross Section Location Plan
Alternative 2 - Capping, Targeted Sediment Removal, and Habitat Enhancement
Slip 4 EE/CA

Figure 3

Attachment A

Executive Summary

Engineering Evaluation/Cost Analysis
Slip 4 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

EXECUTIVE SUMMARY

The City of Seattle and King County are planning a sediment removal action for early cleanup of contaminated sediments in the Slip 4 Early Action Area (EAA) of the Lower Duwamish Waterway (LDW) Superfund Site in Seattle, Washington. Slip 4 is one of seven areas within the LDW that have been identified by the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) as candidate areas for early cleanup because sediments in these areas are associated with greater ecological and/or human health risk. The goal of this sediment cleanup is to significantly reduce unacceptable risks to the aquatic environment resulting from potential exposure to contaminated sediments in the slip. This cleanup will also reduce potential human health and ecological risks associated with polychlorinated biphenyls (PCBs) in sediment within the LDW.

This report presents the engineering evaluation/cost analysis (EE/CA) for the Slip 4 EAA removal action. It presents background information on the site, discusses available data and the proposed boundary of the removal action, documents the development and evaluation of alternatives for conducting the non-time-critical removal action (NTCRA), and discusses the rationale for the recommended removal action. Following public comment on this EE/CA, EPA, in consultation with Ecology, will select the removal alternative that will be implemented by the City and King County.

SITE CHARACTERIZATION AND RISK ASSESSMENT

Slip 4 is located on the east bank of the LDW, approximately 2.8 miles from the southern end of Harbor Island. The slip encompasses approximately 6.4 acres and is approximately 1,400 feet long, with an average width of 200 feet. Properties immediately adjacent to Slip 4 are currently owned by Crowley Marine Services, First South Properties, King County, and The Boeing Company. Crowley owns the majority of the submerged land within the Slip 4 EAA. A part of Crowley's submerged land (called the "inner berth") was historically dredged and permitted for navigation uses. The cleanup alternatives (summarized below) may affect Crowley's navigation uses on their land.

Numerous historical environmental investigations have included the collection of sediment data in Slip 4. Four sediment investigations were conducted in Slip 4 between 1990 and 1999. These investigations included an EPA site investigation (Weston 1999), a National Oceanic and Atmospheric Administration (NOAA) sediment characterization of the Duwamish River (NOAA 1998), a site assessment (Landau 1990), and a dredged material characterization (Exponent 1998). Results of these investigations are summarized in Section 2.3.1 of this report, and the resulting data were described in detail by SEA (2004).

Additional characterization data were collected in Slip 4 in 2004 (Integral 2004a). The initial investigation in April 2004 included collection of surface sediment samples at 29 locations, subsurface cores at 11 locations, and one intertidal composite sample. Bank samples were collected at six locations in July 2004. These investigations are summarized in Section 2.3 of this report and are described in detail by Integral (2004a).

Previous upland investigations adjacent to Slip 4 have included soil and groundwater sampling. These investigations were generally conducted as part of site assessments during property transfers, in conjunction with underground storage tank removal, or during construction when visible contamination (e.g., petroleum-staining) was observed or excavated soil required testing prior to disposal. A Resource Conservation and Recovery Act (RCRA) corrective action is being conducted at Boeing Plant 2. These investigations are also described in SEA (2004).

The removal action boundary encompasses approximately 3.6 acres in the northern half of Slip 4, as shown in Figure 2-18. The development and rationale for the proposed boundary for the Slip 4 removal action is described in the *Revised Draft Technical Memorandum on Proposed Boundary of the Removal Action,* contained in Appendix A of this report. This boundary memorandum was subject to public stakeholder review and comment. Development of the preliminary removal action boundary focused on the areal extent of PCBs because the historical data showed that PCBs were the primary contaminant of concern (SEA 2004); however, full-suite Washington State Sediment Management Standards (SMS) analyses were conducted, and all SMS analytes were considered. Areas where other chemicals exceeded the SMS Cleanup Screening Level (CSL) criteria were encompassed within the area exceeding PCB criteria; there are only two slight Sediment Quality Standard (SQS) exceedances outside the removal action boundary. All surface and subsurface sediment data were considered in developing the preliminary boundary. Additional bank soil and sediment data were collected in 2005 (Parametrix 2005; CH2M Hill 2005a; Bach 2005a, pers. comm.) and are summarized in this EE/CA. These data were used in this EE/CA to refine the boundaries of the removal action on the eastern bank of the slip.

The streamlined risk assessment, presented in Section 2.4, supports the need for the removal action. The ecological risk assessment for Slip 4 focused on the benthic invertebrate community by comparing chemical concentrations in surface sediments to the SMS. PCBs, bis(2-ethylhexyl) phthalate (BEHP), phenol and indeno[1,2,3-c,d]pyrene in surface sediments within the Slip 4 EAA exceed promulgated SMS standards for protection of benthic organisms. More mobile receptors (i.e., fish and wildlife) were assessed in the Phase 1 ecological risk assessment (ERA) for the LDW. The Phase 1 ERA indicted that PCB exposure concentrations were greater than concentrations associated with adverse effects for fish and great blue herons (based on egg data). Arsenic and copper were associated with adverse effects in fish. Other chemicals with exposure estimates greater than no-effects levels but less than the adverse-effects level for one or

more fish or wildlife species included PAHs, mercury, tributyltin (TBT), lead, and arsenic. The removal action is also supported by a summary of the LDW Phase 1 human health risk assessment that includes a list of potential risks to human health associated with PCBs in the LDW. In summary, contaminants found in Slip 4 sediments may have direct benthic community effects, and likely contribute to potential risks throughout the LDW to other ecological receptors and humans through diet exposure.

The proposed removal action will address ecological risks associated with contamination of sensitive ecosystems, which is indicated by the presence of PCBs above the SQS in surface sediments. These sediments provide important habitat for benthic invertebrates and juvenile salmonids, as well as other fish and shorebirds. The proposed removal action will also indirectly reduce human exposure to chemicals by removing or isolating sediment containing bioaccumulative chemicals (i.e., PCBs) that are found in seafood.

Areas in the LDW outside of the Slip 4 removal action boundary will continue to be evaluated by the LDWG, EPA, and Ecology under the LDW Remedial Investigation and Feasibility Study (RI/FS). The LDW RI/FS will include a baseline ecological and human health risk assessment to evaluate potential risks to human health and the environment posed by sediments in the LDW site, and will evaluate cleanup alternatives for areas of the site not addressed by the early actions.

GOAL, SCOPE, AND OBJECTIVES OF THE REMOVAL ACTION

The goal of the removal action at Slip 4 is to conduct an early cleanup that significantly reduces exposure of ecological and human receptors to sediment contamination, thereby reducing or eliminating adverse effects on biological resources in the removal area. The removal action objective is to:

- Reduce the concentrations of contaminants in post-cleanup surface sediments [biologically active zone (0–10 cm)] to below the state Sediment Quality Standards (SQS) for PCBs and other chemicals of interest.

The scope of the removal action includes approximately 3.6 acres within the removal boundaries identified in Section 3 of this EE/CA.

Potential sources of recontamination of Slip 4 sediments were also considered in defining the scope of this removal action. An evaluation of upland sources and source control efforts is included in Section 2.6 and Appendix B. Recontamination pathways of potential concern are bank erosion and stormwater flows that drain to outfalls in Slip 4. The cleanup alternatives described in the EE/CA include actions to address areas where eroding bank soils exceed the SQS.

Investigations by the City and King County indicate potentially significant ongoing sources of PCBs to Slip 4 from stormwater drainage. Control of stormwater sources is

outside the scope of this EE/CA. Ecology, King County, Seattle Public Utilities (SPU), and The Boeing Company are continuing to investigate and implement controls to address these sources. It is important that these sources are adequately controlled prior to construction of the Slip 4 removal action to minimize the potential for recontamination of Slip 4 sediments. Ecology will make the final decision regarding source control effectiveness and completeness (Ecology 2004). Following EPA and Ecology's assessment and before implementing cleanup actions, the City of Seattle and King County will consider whether or not source control is considered adequate to prevent recontamination to levels of concern.

IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Section 4 includes an initial screening of technologies that may be applicable to cleanup of Slip 4. In Section 5, the retained technologies are developed into four removal alternatives that range from an emphasis on containment (with minimal removal) to an emphasis on removal (with minimal containment). The four alternatives developed for the Slip 4 removal area are:

- **Alternative 1** is based on a containment approach, primarily involving capping of contaminated sediments in place. Prior to capping, limited excavation and offsite disposal would occur at the head of the slip to accommodate outfall grading requirements, and on banks to ensure no net loss of aquatic habitat. Derelict piling and debris would be removed. Engineered sediment caps would be constructed over the entire Slip 4 removal area, including engineered slope caps on the affected banks. Portions of the cap would be thickened and graded to expand and enhance shallow subtidal and intertidal habitat. Alternative 1 limits the landowner's potential use of a permitted berthing area in the inner portion of the slip. As compensation, the City of Seattle is willing to purchase the affected property from the landowner if this alternative is selected.
- **Alternative 2** includes targeted removal of contaminated sediments at the head of the slip, along with capping. The objectives of dredging would be to remove near-surface material with the highest concentrations of contaminants, minimize changes to mudflat habitat at the head of the slip, and accommodate outfall flows. Piling and debris would be removed, and banks would be excavated to ensure no net loss of aquatic habitat. Engineered sediment caps would be constructed over the entire Slip 4 removal area, including engineered slope caps on the affected banks. Portions of the cap would be thickened and graded to expand and enhance shallow subtidal and intertidal habitat. Alternative 2 limits the landowner's potential use of a permitted berthing area in the inner portion of the slip. As compensation, the City of Seattle is willing to purchase the affected property from the landowner if this alternative is selected.

- **Alternative 3** includes dredging in the head and inner berth areas of the slip, along with capping. The objectives of dredging would be to remove near-surface material with the highest concentrations of contaminants, minimize changes to mudflat habitat at the head of the slip, accommodate outfall flows, remove contaminated material in the inner berth to re-establish historically permitted navigation depths (-15 feet MLLW), and attain a clean dredged surface in the inner berth. The dredging would be limited in scope to minimize impacts to adjacent structures and outfalls. Derelict piling and debris would be removed, and banks would be excavated to ensure no net loss of aquatic habitat. Engineered sediment caps would be constructed in the areas outside the inner berth, including engineered slope caps on the affected banks.
- **Alternative 4** includes the greatest amount of dredging within Slip 4 among the four alternatives. The dredging would have the overall objective of removing all contaminated material where reasonably feasible, but the dredging would be limited in scope to minimize impacts to adjacent structures and outfalls. As with Alternative 3, this alternative would re-establish historically permitted navigation depths in the inner berth. Piling and debris would be removed, and banks would be excavated to ensure no net loss of aquatic habitat. To minimize habitat disturbances by the deepening, the areas outside the inner berth would be backfilled with clean material. In areas where dredging could not remove all contaminated materials, the backfill would be designed to function as a cap. Engineered slope caps would also be constructed in bank areas.

In developing the removal alternatives, consideration was also given to a "maximum feasible removal" alternative, involving removal of most or all of the contaminated sediments within Slip 4, with an objective of avoiding the need for capping. Site limitations (including slope stability, structural stability of piers, outfalls, and bulkheads, and depth of contamination) would require extensive engineering measures to accomplish complete removal of all contaminated material. This approach would offer potentially greater long-term effectiveness because most of the contaminated materials would be removed from the site. However, it would have greater short-term impacts during construction, could require two construction seasons to implement, and would have substantially greater incremental costs than other, equally protective alternatives. The incremental cost of this approach is considered to be substantial and disproportionate to any benefits, and therefore the "maximum feasible removal" approach was not carried forward.

A no-action alternative was not considered for the Slip 4 removal area because it would not satisfy the removal action objectives or meet the needs and purposes of a NTCRA.

ANALYSIS AND RECOMMENDATIONS

The four removal alternatives are analyzed in Sections 5 and 6 with regard to EPA's criteria of effectiveness, implementability, and cost. This analysis is summarized below:

- **Effectiveness:** The effectiveness evaluation considers overall protection of human health and the environment, achievement of the removal action objective, compliance with applicable or relevant and appropriate requirements (ARARs), reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, and long-term effectiveness and permanence. For overall effectiveness, Alternative 2 ranks highest, followed by Alternatives 1, 4, and 3. Each alternative would provide overall protection of human health and the environment and can achieve the removal action objectives. Each alternative can be implemented in compliance with ARARs. Alternative 2 provides the greatest quantity and highest quality habitat for threatened Puget Sound chinook and Coastal/Puget Sound bull trout, with Alternative 1 providing slightly less habitat benefits. Alternatives 3 and 4 would significantly decrease shallow subtidal and lower intertidal habitat area and would require more armoring, which may decrease habitat quality. Alternatives 1 and 2 are similar in their short-term effectiveness and are not expected to pose significant recontamination risk outside the removal area. Due to the greater amount of dredging and longer project duration, Alternatives 3 and 4 would pose a greater short-term risk of recontamination caused by dredging and would have greater short-term water quality impacts during dredging. Each alternative would be effective in the long-term; however the consequences of possible cap erosion would be greatest under Alternative 1. The potential for erosion is greatest under Alternatives 3 and 4 (due to navigation), and hence Alternatives 3 and 4 may require somewhat greater maintenance over the long-term. Each alternative would include institutional controls, long-term monitoring, and periodic reviews to ensure long-term protectiveness.
- **Implementability:** The implementability evaluation considers the technical and administrative feasibility of implementation, as well as the availability of materials, equipment, and services. For overall implementability, Alternatives 1 and 2 rank highest, followed by Alternatives 3 and 4. Each of the alternatives can reliably be implemented; however, Alternatives 3 and 4 would require additional consideration of design, monitoring, and construction elements so that a clean sediment surface is left in the inner berth and in adjoining areas south of the removal boundary. Under Alternatives 3 and 4, removal of under-pier sediments and placement of under-pier cap material would also require special provisions.
- **Cost:** The cost evaluation considers capital costs, long-term monitoring and maintenance costs, and total present worth costs. Alternative 1 is the least expensive alternative, followed by Alternatives 2, 3, and 4. Alternative 2 would

cost approximately 15 percent more than Alternative 1. Alternative 3 would cost roughly 50 percent more than Alternative 1. Alternative 4 would cost roughly twice as much as Alternative 1.

The City and King County recommend Alternative 2 because it represents the most practical and cost-effective balance of contaminant removal and containment while maximizing long-term effectiveness, providing the greatest habitat benefits, and minimizing potential long-term maintenance requirements.

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Attachment B

Responsiveness Summary

for Public Comments on the Engineering Evaluation/Cost Analysis
Slip 4 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

This document summarizes and responds to public comments submitted on the Engineering Evaluation/Cost Analysis (EE/CA) for the proposed removal action at the Slip 4 Early Action Area at the Lower Duwamish Waterway Superfund Site in Seattle, Washington.

The EE/CA was available for public review and comment from February 17 through March 18, 2006. Notice of this comment period was published in the *Seattle Times* and *El Mundo* at the start of the 30-day public comment period. Notice of this public comment period was also announced in the February 24, 2006 edition of the Washington Department of Ecology's *Site Register* and by postcards in English and Spanish. Notice of the comment period, public meeting, and a summary of the proposed EE/CA alternatives were described in a Slip 4 Fact Sheet (February 2006) that was mailed to approximately 950 addresses. Fact sheets in Spanish (about 400) were also distributed. Announcements were also placed on EPA's website and the EPA web calendar. Public outreach was also performed by the Duwamish River Cleanup Coalition (DRCC), EPA's Community Advisory Group for the site.

EPA held a public meeting in the Georgetown neighborhood on March 7, 2006. The meeting was attended by approximately 120 people. Public comments were recorded by a court reporter.

EPA received eight comment letters and comment forms during the public comment period, and 14 individuals provided spoken comment at the public meeting. Original public comment documents and the transcript from the public meeting are provided in the administrative record. Consistent with EPA guidance (OSWER Directive 9360.3-01), responses to all significant comments are provided below. Each response includes a paraphrased summary of the original comment, as well as reference to the source of the comment. Several comments were made more than once. In these cases, the paraphrased summary may include more than one reference or may cross-reference other responses.

Some EPA responses include references to the *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA 2005)*, which is available from EPA's Superfund program website at http://www.epa.gov/superfund/resources/sediment/guidance.htm.

Sources of Comments on the Engineering Evaluation/Cost Analysis

Document	Author(s)	Description
DRCC	Duwamish River Cleanup Coalition (DRCC)	Comment letter dated March 17, 2006 – Incorporates and expands on comments provided by DRCC at March 7, 2006 Public Meeting
MITFD	Glen St. Amant, Muckleshoot Indian Tribe Fisheries Division (MITFD)	Comment letter dated March 17, 2006
WRIA	Doug Osterman, Water Resource Inventory Area 9 (WRIA 9) Watershed Coordinator	Comment letter dated March 17, 2006
CC1	(b) (6)	Comment card
CC2	(b) (6)	Comment card
CC3	Patty Foley, Director of Georgetown Council	Comment card
Manson	Pat McGarry, Manson Construction Co.	E-mail dated February 21, 2006
BD	(b) (6)	E-mail dated March 22, 2006
PC	14 individuals at the March 7, 2006 Public Meeting	Public comments provided at March 7, 2006 public meeting, as recorded in the court reporter's transcript

The comments in these documents have been numbered, and the document(s) and comment number(s) are identified in parentheses after each comment in this responsiveness summary.

Responses to Comments

1. **The organizations and communities represented by the Duwamish River Cleanup Coalition (DRCC) have serious concerns and reservations about cleanup plans for sites along the Duwamish River that leave substantial volumes of PCBs and other chemicals in place. Sediment caps have a relatively short history (about 20 years), capping technologies are incompletely demonstrated, and chemicals under caps may be eroded or released by earthquakes. All PCBs and similarly toxic substances should be removed from the river basin, rather than buried under a cap. EPA must demonstrate the effectiveness of capping and publish a report on the capping success and failure rate in this region. This is critical to providing adequate information to demonstrate that capping is safe over the long term and in the event of earthquakes and other catastrophic events. (DRCC-1; BD-2; PC-1; PC-13; PC-23; PC-29; PC-30)**

   EPA believes that capping is an effective solution for the contaminated sediments in Slip 4. In recent EPA *Contaminated Sediment Remediation Guidance* (EPA 2005), capping is identified as one of the three main cleanup approaches for contaminated sediment sites. Capping contaminated sediments is a proven method that has been successfully used in the Northwest to eliminate human and animal exposure to contamination.

   Caps are designed to reduce risk to people and the environment through the following primary functions (EPA 2005):

   - Caps are designed to physically isolate the contaminated sediment so that people and animals do not contact the contaminated sediment, and so that animals do not burrow into the sediments and move contaminants to the surface;

   - Caps are designed to isolate the chemicals beneath the cap, which minimizes the movement of contaminants into the water column;

   - Caps are designed to stabilize both the contaminated sediment and the cap itself to prevent either from being resuspended and transported from the capping location (e.g., due to storms or earthquakes).

   Once a sediment cap is constructed, EPA requires that the cap be routinely monitored to demonstrate that the cap remains effective and protective of people and the environment. Implementation of this monitoring ensures that the cap is performing the basic functions (physical isolation, chemical isolation, and sediment stabilization) as required to meet the removal action objectives. Also, EPA requires that monitoring be performed after major events such as earthquakes.

   Using the information collected during long-term monitoring activities at a sediment cap, EPA may require cap maintenance activities (e.g., repair and replenishment of erosion protection layers) and cap contingency actions (e.g., actions to be taken in the case that one or more cap

functions are not being met). For the Slip 4 Early Action Area, the City of Seattle and King County will perform required long-term monitoring activities and any necessary cap maintenance or cap contingency actions, pursuant to a legal agreement with EPA.

Additional information on capping is provided below.

EPA's *Contaminated Sediment Remediation Guidance* includes a summary of the extensive work that has occurred on capping remediation technologies (see Chapter 5). Chapter 5 also describes the site conditions that are important to understand when evaluating the feasibility and effectiveness of capping, and cap design requirements are detailed. Additional comprehensive technical guidance on design requirements for capping of contaminated sediments can be found in *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments (EPA 1998)* and the *Assessment and Remediation of Contaminated Sediments Program Remediation Guidance Document (EPA 1994)*, which are available through EPA's website at http://www.epa.gov/glnpo/sediment/iscmain.

Regionally, for the overall Lower Duwamish Waterway Site, EPA and Ecology have approved a report that identifies sediment cleanup technologies that may be applicable to the contaminated sediments within the site. This report includes extensive information on capping [see Chapter 7.1 in *Identification of Candidate Cleanup Technologies for the Lower Duwamish Waterway Superfund Site (RETEC, December 12, 2005)*].

Finally, EPA's regional experience with capping is successful and well-documented. Caps have been in place for one to 18 years at a number of EPA Region 10 Superfund sites, including St. Paul Waterway and other Commencement Bay cleanup areas, Eagle Harbor, Puget Sound Naval Shipyard, and Pacific Sound Resources. Detailed documentation about the construction and monitoring of these sites, including remedial design documents, remedial action work plans, construction completion reports, long-term monitoring plans, and long-term monitoring results, are available at EPA Region 10's Superfund records center. These long-term monitoring results have shown that our Superfund sediment capping projects continue to be successful, and no remedy failures have occurred.

EPA understands that DRCC would appreciate further discussion on this topic, and we and the City of Seattle are committed to ongoing communications on this topic.

2. **Given the alternatives presented in the EE/CA, the recommended alternative (Alternative 2) has DRCC's qualified support, based on satisfactory resolution of the issues and comments detailed in our letter. (DRCC-3; PC-9)**

   Thank you for your support.

3. **As part of the overall cleanup and restoration of the Lower Duwamish, the Slip 4 early action can contribute to recovery of Chinook salmon by complementing other watershed habitat recovery efforts. The Water Resource Inventory Area 9 (WRIA 9) staff endorse the preferred alternative (Alternative 2). (WRIA-1)**

Thank you for your support.

4. **Alternative 2 offers the greatest amount and desired type of shallow water habitat rehabilitation for juvenile Chinook salmon. We commend the federal, state, and local agencies for including habitat rehabilitation as an integral part of the cleanup. (WRIA-2)**

   Comment noted.

5. **I strongly support Alternative 2. When compared with the other alternatives presented to the community, Alternative 2 removes the most harmful sediment from the river, allows for a maximum of habitat restoration, and provides some potential opportunities for future public access of the river. (BD-1)**

   Thank you for your support.

6. **Much of the support for Alternative 2 is driven by the habitat benefits that are included in Alternative 2, as well as not very good options for what else to do with the material that's down there. If we take the sediments out, they are not going to be treated or destroyed, they are going to be moved – and that's driving some of the support for capping. (PC-10)**

   Comment noted.

7. **The EE/CA does not include any details on how the cap can and will be designed to accommodate site conditions that may or will threaten the cap (e.g., earthquakes, prop wash). (DRCC-12; PC-27; PC-30)**

   The EE/CA includes general information on cap design requirements, including a discussion that caps would be designed for long-term seismic stability and resistance to erosive forces from outfall flows and propeller wash (e.g., see Section 4.4 and 5.5.1). However, specific design requirements are not determined until after the cleanup alternative has been selected by EPA, after consideration of public comments on the EE/CA. Design requirements will be described in the project design documents, including prefinal and final designs and construction plans and specifications. EPA has agreed to make these documents available to the public before they are final.

8. **Demonstrate how the cap will be designed to remain intact and functional with the hydrostatic pressure of groundwater from adjacent uplands beneath and beside the cap. (DRCC-4; PC-6)**

   The caps will be designed using well-established engineering guidance, which specifically deals with groundwater flow issues. The caps will be constructed of clean sand, gravel, and rock that allow groundwater to freely flow through the cap, so there will be no buildup of hydrostatic pressure behind or beneath the cap. Groundwater will continue to flow to Slip 4 in the same way it currently does.

While caps allow the groundwater itself to flow, they do not allow contaminants to move through the cap and cause recontamination of the surface. Caps are designed for *filtering,* which physically prevents any contaminated sediment particles from moving through the cap. Caps are also designed for *adsorption*, which prevents any dissolved contaminants from moving through the cap. The design will include specifications of cap materials and thicknesses that will ensure these cap functions are met.

Technical guidance on design requirements for capping of contaminated sediments can be found in *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments (EPA 1998)* and the *Assessment and Remediation of Contaminated Sediments Program Remediation Guidance Document (EPA 1994)*, which are available through EPA's website at http://www.epa.gov/glnpo/sediment/iscmain.

9. Estimates of the area expected to be subject to scour near the outfall(s) should be presented in the EE/CA, and the scour footprint should be minimized through optimal design and channeling of the scour pathway. (DRCC-15)

The EE/CA (p. 83) includes a description of the general approach for directing outfall stormwater flows into a shallow swale that will be engineered into the cap at the head of the slip. As stated in the EE/CA, the swale is expected to occupy roughly 0.1 acre. (This description is presented under the Alternative 1 discussion but is also applicable to Alternative 2 and is referenced on p. 96 in the Alternative 2 discussion). The specific configuration of the swale will be optimized in the design, with a goal of optimizing habitat quality while providing appropriate erosion protection.

10. Capping with sand and gravel will not be very lasting or effective. When the sand and gravel washes away, the problem will still be there (CC2-2)

EPA's experience with other sediment caps has shown that a properly designed and engineered cap comprised of sand and gravel will be a protective cleanup remedy for Slip 4. Capping protectiveness and long-term performance is based on well-established scientific and engineering principles, well-defined legal mechanisms for land-use control, national EPA and Army Corps of Engineers guidance and policy, and an established track record of success regionally, nationally, and internationally. The cap will be designed so that the cap material will not wash away, and monitoring will confirm this and identify any need for maintenance. Also see Response to Comments 1, 7, and 8.

11. The cap design should be independently reviewed before EPA approval. (DRCC-8; PC-2)

EPA, and EPA's oversight contractor, will independently review all design documents submitted by the City of Seattle and King County before EPA approves the design documents.

12. The end of the navigation channel and the beginning of the cleanup area should be marked to prevent barges and tugs in Slip 4 from disturbing the cap. (DRCC-11; BD-5; PC-8)

EPA agrees that it will be important to implement measures that will minimize or eliminate disturbances of the sediment cap. Some of these measures will be incorporated into the design of the cap (e.g., larger-sized cobbles may be placed on the surface of the cap to minimize sediment erosion from vessels or stormwater discharges from pipes). Other measures, such as the need for signage or restrictions on site use, will be specified during cap design in the *Institutional Control Implementation Plan* (see pp. 86-88 of the EE/CA). This plan will include an analysis and recommendation of *institutional controls* that will be required to ensure the long-term protectiveness and integrity of the remedy, and would exist in perpetuity. Institutional controls are administrative and/or legal controls that help to minimize the potential for human exposure to contamination and/or protect the integrity of the remedy (see http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm).

Under the selected cleanup alternative, the City of Seattle will be the owner of the property where the sediment cap is constructed, so it will have the ability to control site use.

13. **After the cleanup is completed, monitoring of chemical contamination should occur in years 1, 2, and 3; don't wait until 5 years after cleanup. The cap should be inspected annually. Monitoring should include cap chemistry, habitat integrity, and shellfish quality. Initial monitoring should make sure recontamination is not occurring. Contingency plans should be developed for less than ideal results and responsibility for cap maintenance and repair should be assigned. (various comments provided by DRCC-9; CC3-2; MIFTD-2; BD-4; PC-5; PC-7; PC-28; PC-34)**

After the cleanup is completed in Slip 4, monitoring will occur to ensure that the cleanup *remains* protective of people and the environment. EPA agrees that monitoring should not wait until year 5; typically, sampling occurs at least two or three times within the first five years. Monitoring will include visual inspections, bathymetric surveys, and sediment sampling and chemical analysis. The resulting monitoring data will be used to evaluate the long-term effectiveness and protectiveness of the remedy, and whether any contingency or corrective actions are necessary. Long-term monitoring is a standard component of EPA's cleanup program, and is generically described in Section 5 of the EE/CA. Further details on the development of an effective monitoring plan at contaminated sediment sites are described in Chapter 8 of EPA's *Contaminated Sediment Remediation Guidance.*

For Slip 4, the details for post-cleanup monitoring and contingencies will be set forth in a Long-term Monitoring and Reporting Plan that will be prepared by the City and County for EPA approval. This plan will be developed in consideration of site-specific conditions and information, including information on the final remedy that was constructed. This plan will be shared with the public during its development. The City and County will perform long-term monitoring with EPA oversight. Future long-term monitoring results will also be shared with the public. Long-term monitoring obligations will be set forth in a legal agreement between the City, County, and EPA, and this legal agreement will be finalized before the cleanup commences.

Within the Superfund Program in Region 10, EPA-approved long-term monitoring plans and results for sediment capping projects are available for projects including (but not limited to) the St. Paul and Olympic View Resource Area (Commencement Bay Nearshore/Tideflats Site), the Pacific Sound Resources Site, Eagle Harbor/Wyckoff Site, and Puget Sound Naval Shipyard.

14. **A long-term monitoring program should be conducted to confirm the integrity of the cap in terms of resistance to human-caused disturbance, natural erosive forces, and biological activity. Given that cleanup project proponents are typically responsible for monitoring only the first ten years after project completion, and that data could be useful, we encourage EPA to explore ways to support additional monitoring. An adaptive management mechanism should also be provided for additional remedial action that may be necessary. Please share monitoring results with WRIA 9 Salmon Habitat Recovery Team. (WRIA-3)**

    For Superfund projects, long-term monitoring is not limited to only the first ten years. Before conducting the cleanup, EPA will have a legal agreement with the City of Seattle and King County that will require that long-term monitoring be performed as long as deemed necessary by EPA. Essentially, when contaminated sediments are left in place, some form of monitoring is required in perpetuity. The monitoring effort will include contingencies such as an adaptive management mechanism to ensure that the remedy remains protective of human health and the environment.

15. **In order for the Tribe to support Alternative 2, assurances about long-term monitoring and success must be confirmed, including assurances that additional cleanup actions will commence if monitoring determines that the remedy was not successful in achieving the goals. (MIFTD-3)**

    EPA will ensure that long-term monitoring occurs to verify the continued effectiveness of the remedy in protecting human health and the environment and verify the continuing performance and structural integrity of barriers to contaminant transport. Should additional cleanup action ever prove necessary, EPA and/or Ecology will ensure that it is implemented.

    Also, see Responses to Comment 1 and 13.

16. **The statements that Alternative 2 provides the best protection of people and the environment, and that it is cost-effective, are not substantiated. (PC-25)**

    EPA believes that the EE/CA meets the requirements of EPA's regulations and guidance for removal actions, and documents that Alternative 2 is protective of people and the environment and is cost-effective. EPA understands that there are uncertainties associated with every decision that need to be weighed and evaluated, but decisions must be made in light of that uncertainty. EPA believes that given a large number of site-specific considerations, Alternative 2 is the best choice given a comparative analysis of removal action alternatives (see Sections 6 and 7 of the EE/CA).

Additional information on cost-effectiveness is provided on p. 7-3 of EPA's sediment guidance: "The evaluation of an alternative's cost effectiveness is usually concerned with reasonableness of the relationship between the effectiveness afforded by each alternative and its costs when compared to other available options."

17. Regardless of which alternative is selected, we fully support habitat enhancement being a part of this cleanup project. (PC-12)

Comment noted.

18. The proposed habitat enhancement in Alternative 2 has the potential to provide a permanent, positive change in the nature of the shoreline and immediate upland habitat. Clear administrative requirements in EPA's cleanup order must ensure that the habitat area and quality be maintained. (DRCC-14; PC-7)

EPA agrees.

19. There is a "hot spot" of PCB contamination on the south side of Slip 4 near stations SL4-10/10A that should be removed when the dredging is conducted. This station has high levels of PCBs in surface sediments to two feet deep. Removing sediments in this area would add minimal cost and would remove another area of high concentration contamination. (DRCC-6; PC-4)

EPA agrees that sediments near Station SL4-10/10A are contaminated with PCBs. However, EPA does not agree that these sediments represent a "hot spot" of PCB contamination that requires physical removal. We believe that the selected cleanup remedy (i.e., capping) will effectively isolate the PCB contamination at this station, and that the remedy will be protective of human health and the environment over the long term.

First, EPA does not consider the PCB concentrations at Station SL4-10/10A to be a "hot spot" area based on the nature and extent of site-specific PCB concentrations reported for the Slip 4 Early Action Area (see Chapter 2 of the EE/CA). The sample mentioned in the comment was collected over 15 years ago, and more recent data collected near this station show that PCB concentrations in the top 4 to 6 inches of sediments are far below the State Cleanup Screening Level (see Figure 2-10 of the EE/CA). Second, concentrations of PCBs in the sediments at this station are not substantially different than PCB concentrations in other areas that will be effectively contained by capping as part of this removal action. EPA believes that the removal of additional sediments in the vicinity of this station will not contribute to overall net risk reduction in Slip 4. As described in EPA's *Contaminated Sediment Remediation Guidance*, deeper contaminated sediment that is not currently bioavailable or bioaccessible, and that is unlikely to be exposed in the future, does not necessarily contribute to site risks and may not need removal (see Highlight 6-11 and Section 7.3, EPA 2005).

Further, there is no justification for presuming that removal of these sediments would add minimal costs. Given that the PCB concentrations in this area are not appreciably different than

other PCB concentrations, it would be difficult to establish a clear-cut boundary or risk-based "action level" for defining where this additional dredging would start and stop; thus, the "chasing" of PCBs would likely result in significant cost increases.

EPA clarifies that although the comment indicates that PCB concentrations are elevated in the top 2 feet, there are actually no data representative of the 0-2 foot interval at this station. At Station SL4-10/10A, historical subsurface sediment data (from 1990) exist for the top 0.5 feet, 2-4 feet, and 6-8 feet, as follows:

- 0 – 0.5 feet: PCB concentrations are 358 ppm-carbon normalized (5.8 ppm dry weight).
- 0.5 to 2 feet: No samples analyzed. The reference to 347.9 ppm-carbon normalized data in Figure 2-8 of the EE/CA is an error, as noted in the errata section at the end of this responsiveness summary.
- 2 – 4 feet: PCB concentrations are 276 ppm-carbon normalized (3.8 ppm dry weight).
- 6 – 8 feet: PCB concentrations are 96.3 ppm-carbon normalized (5.2 ppm dry weight.

As noted above, more recent surface data in this area show that PCBs are well below the Cleanup Screening Level in surface sediments.

20. One surface hot spot not included in the removal/dredging plan should be added: PCBs, phthalates, and PAHs at sample locations along the mid-southern edge of the site should be removed (specifically, locations SL4-10A, SL4-5A, SCO4 and SD0063). (BD-3)

EPA does not agree that the sediments in the vicinity of these stations must be physically removed from Slip 4 to ensure that people and the environment are protected. EPA believes that the engineered sediment cap that will be placed in the vicinity of these stations, along with the required long-term monitoring components, will be protective of people and the environment.

Historic surface samples in this area showed that PAHs slightly exceeded the State of Washington Sediment Quality Standard (the lower of the two state standards) and that one phthalate exceeded the Cleanup Screening Level (the higher of the two state standards) (see Figure 2-7 in the EE/CA). The capping remedy designed for long-term isolation of PCBs in this area will also be protective for these other chemicals.

Also, see Response to Comment 19.

21. In Slip 4, contaminants should be contained during sediment dredging activities. Physical containment with a silt curtain or similar barrier, and frequent water quality monitoring during dredging, should be performed. (DRCC-13; PC-18)

EPA agrees that the short-term risks associated with dredging should be considered during the project design and construction. An analysis of this type of information is required in project

design documents, which include a Water Quality Monitoring Plan, and in removal action work plans that will be prepared by the City of Seattle and/or King County. Based on the analyses set forth in these documents, monitoring requirements and best management practices (e.g., specific dredging procedures) and potential engineering measures (e.g., containment barriers) for the project will be detailed for EPA review and approval. Project experience in Region 10 at similar sites has shown that typically, best management practices are successful in limiting contaminant resuspension and meeting water quality standards. Engineering measures such as silt curtains can be employed as a contingency, to be available if monitoring shows that the established best management practices are not meeting the water quality standards.

Further, EPA will identify project-specific requirements to ensure compliance with the substantive requirements of the Clean Water Act. These requirements will be described in a Clean Water Act Section 401 Water Quality Certification that is administered by EPA. The certification includes water quality monitoring, applicable water quality standards, allowable times for environmental work, and implementation of best management practices. Finally, best management practices (or "conservation measures") will be described in documents that are prepared for compliance with the Endangered Species Act.

22. The dredged sediments should be transported in a safe (covered) manner, and responsibly disposed of. (CC3-3) If we do remove sediments, what landfill will be used, and how is it constructed? (PC-36)

EPA agrees. All truck and rail transport containers will be covered. Dredged and excavated sediments and soils will be disposed of in landfills that are permitted for this type of material. Detailed information will be provided in project design documents and removal action work plans prepared by the City of Seattle, King County, and their subcontractor(s).

The specific landfill that will be used will be identified by the contractor performing the work. EPA must approve the use of the landfill prior to off-site shipment of materials.

The Washington Department of Ecology, which regulates landfills in our state, has provided information on sediment disposal at landfills (see Attachment B-1).

23. Sediments should be dredged by cutting out chunks of sediment (similar to making igloos) instead of using buckets that might have overflow and spread PCBs into the river. (PC-21)

EPA understands concerns about sediments being resuspended by dredgers, and EPA intends to require best management practices and engineering measures during construction to minimize the movement of contaminated sediments outside the Slip 4 Early Action Area. EPA is not aware of any dredging technologies that cut chunks of sediments – generally, sediments are very soft and watery and it is not possible for chunks to remain intact.

24. DRCC supports treatment of contaminated sediments wherever feasible, and challenges EPA to aggressively pursue alternative treatment technologies in order to craft environmentally responsible long-term solutions that offer true "cleanup" of contaminated

sediments. (DRCC-2) A regional treatment facility should be developed for sediment from all over the Duwamish and other sites in Puget Sound. (PC-24; PC-35)

EPA evaluated sediment treatment technologies for their applicability to the Slip 4 removal action. EPA determined that sediment treatment technologies would not be retained for further consideration in developing the cleanup alternatives set forth in the EE/CA. This information is thoroughly described in Section 4.5 of the EE/CA. EPA's determination for Slip 4 is consistent with Superfund's contaminated sediment guidance (EPA 2005), which states: "Based on available technology, treatment is not considered practicable at most sediment sites."

For the overall Lower Duwamish Waterway Site, EPA has been responsive to DRCC's concerns about treatment technologies. EPA held a briefing for DRCC and other stakeholders on sediment treatment in July 2004, and the current knowledge on sediment treatment technologies has been summarized in the report *Identification of Candidate Cleanup Technologies for the Lower Duwamish Waterway Superfund Site (RETEC, December 12, 2005).* Similarly, the Port of Seattle and the City held a community workshop on sediment treatment for Slip 4 and T-117 in July 2005. EPA continues to work with DRCC in facilitating an information-sharing meeting on treatment technologies with Eric Stern (EPA Region 2).

25. The EE/CA includes a section on sediment treatment, which dismisses BioGenesis based on incomplete information and reliance on previous reports that are deeply flawed. (DRCC-16)

EPA believes that the information on BioGenesis presented in Section 4.5 of the EE/CA represents our understanding based on current knowledge about BioGenesis. As described in the EE/CA, EPA believes that BioGenesis is not viable for the early action sites in the Lower Duwamish Waterway Site because its effectiveness is unproven for Slip 4 sediments, pilot testing to prove its effectiveness would be expensive and time-consuming and would delay cleanup, it would be difficult to implement, and it is not cost-effective given current market conditions in the Northwest. EPA remains committed to furthering our understanding of available sediment treatment technologies, including BioGenesis, for the overall Lower Duwamish Waterway Site and we are currently planning an information-sharing meeting on this topic with DRCC and other stakeholders.

26. "Natural Recovery" is not appropriate for contaminants that do not degrade. The EE/CA should not include "natural recovery" as part of the remedy for these contaminants. (DRCC-7)

The selected alternative, Alternative 2, does not include "monitored natural recovery" as part of the remedy.

With regard to the concern that "natural recovery" is inappropriate for contaminants that do not degrade, EPA (2005) *Contaminated Sediment Remediation Guidance* includes monitored natural recovery (MNR) as a potential remedy for contaminated sediment (see Chapter 4). For an MNR remedy, biodegradation is only one of the many different natural processes that may reduce risk

from contaminated sediment (see Highlight 4-1 of EPA 2005). Burial of contaminated sediments by clean sediment is often the dominant process relied upon for natural recovery, with multiple physical, biological, and chemical mechanisms frequently acting together to reduce risk.

27. "Enhanced natural recovery" should not be included as part of Alternative 3 or 4 because contaminants will not degrade or appreciably break down. Instead, the contaminated sediments should be removed or capped. (DRCC-19)

EPA did not select Alternative 3 or 4 as the remedy for the Slip 4 Early Action Area, and Enhanced Natural Recovery (ENR) has not been identified as a component of the selected cleanup alternative (i.e., Alternative 2). With regard to the comment that ENR is not an appropriate remedy for contaminants that do not biodegrade, EPA (2005) *Contaminated Sediment Remediation Guidance* includes ENR as a remedy for contaminated sediment (see Section 4.5) that can be considered for remedy selection based on site-specific considerations.

EPA would like to clarify that for Alternatives 3 and 4, the primary cleanup technologies identified for contaminated sediments were *excavation/dredging* and *capping*. ENR was not identified as a primary cleanup technology. As described in Sections 5.3.1 and 5.4.1 of the EE/CA, ENR was identified as a potential contingency action only to address management of "residuals." After dredging or excavation action, some disturbed, contaminated material may remain at the new surface – this material is referred to as "residuals." Residuals can affect the dredged or excavated area as well as nearby surrounding areas. After construction, chemical sampling of the new sediment surface would occur to determine whether it meets cleanup standards. If cleanup standards were exceeded, Alternatives 3 and 4 proposed that residuals could be managed using one or more contingency actions (e.g., additional dredging, additional capping, monitored or enhanced natural recovery).

28. The removal action objective may not be sufficient to address the goal of significantly reducing exposure of ecological and human receptors to sediment contamination. Sediment and tissue concentration levels should be developed and utilized as performance standards to determine compliance with the goal of protecting ecological and human receptors. These sediment and tissue performance standards should be used in the long-term monitoring program and they are necessary to "reduce or eliminate the exposure pathways to PCBs in sediments within the removal area." (MIFTD-1)

EPA believes that the cleanup at the Slip 4 Early Action Area can meet our cleanup goals. The Slip 4 sediment cleanup will significantly reduce exposure of humans and ecological receptors to sediment contamination. The sediment with the highest PCB concentrations will be removed, and remaining sediments, which have lower concentrations, will be capped. Contaminated soils in banks will also be cleaned up. Further, the entire 3.6 acres of the Slip 4 Early Action Area will be capped with clean sand, gravel, and rock. These capping materials will not contain detectable levels of bioaccumulative chemicals, such as PCBs and mercury.

EPA recognizes the importance of protecting the Tribe's fishing rights in the Duwamish Waterway. As part of the overall risk assessments for the Lower Duwamish Waterway Site,

EPA will be evaluating "safe" levels in fish and shellfish tissue. However, this information is not yet available and continues to be a significant work effort for all parties involved. While the development of tissue-based performance standards is beyond the scope of this early action, EPA believes the Slip 4 cleanup will address risks to human and ecological receptors -- the entire Slip 4 Early Action Area will be capped with clean sand, gravel, and rock, and thus all chemical concentrations will be below background concentrations. EPA will evaluate whether contaminant levels need to be reduced in sediments to be protective beyond the Slip 4 boundary after completion of the human health and ecological risk assessments and the food web model for the overall Lower Duwamish Waterway Site.

29. Source control is incomplete. EPA and Ecology must fully identify ongoing sources of pollution, including portions of The Boeing Company Plant 2 that are uninspected, and develop an effective source control plan to protect Slip 4 from recontamination, before cleanup begins. (DRCC-5; BD-6; PC-3; PC-14; PC-26; PC-41)

EPA agrees that adequate source control efforts must be completed before the sediment cleanup begins, to minimize the potential for recontamination of sediments.

Ecology is the lead agency for source control efforts at the Lower Duwamish Waterway Superfund Site. Source control for some facilities, such as Boeing Plant 2, are managed under EPA's Resource Conservation and Recovery Act (RCRA). The Lower Duwamish Waterway Source Control Strategy (Ecology 2004) describes the process for identifying source control issues and implementing effective source controls for the waterway. The basic plan is to identify and manage sources of potential contamination and recontamination, in coordination with sediment cleanups.

A Source Control Action Plan for the Slip 4 Early Action Area is currently available for public review. The plan documents what is known about the area, the potential sources of recontamination, actions taken to address them, and how to determine when adequate source control is achieved for an area. Ecology will revise the Source Control Action Plan as new information is obtained and progress is made towards achieving source control.

Before the sediment cleanup begins, Ecology, in consultation with EPA, will determine when adequate source control actions have been implemented, to minimize the potential for recontamination of sediments. Following EPA and Ecology's assessment, and before implementing cleanup actions, the City of Seattle and King County will consider whether or not adequate source control actions have been implemented.

EPA has provided Ecology with a copy of DRCC's comment letter for its consideration during implementation of source control actions associated with the Slip 4 Early Action Area.

30. Will stormwater discharges from I-5 be treated prior to discharge to Slip 4? (PC-31)

Specific comments on source control activities have been forwarded to the Washington Department of Ecology for its consideration during development of the Source Control Action Plan for Slip 4.

31. **We commend the agencies for their efforts to date to evaluate non-point pollution sources and work to control those sources in the drainages emptying into Slip 4. We encourage continued sustained and comprehensive source control to identify and abate remaining sources of pollution and to detect sources quickly. Cleanup and rehabilitation should occur after source control has accomplished a reduction in contamination such that subsequent pollution does not exceed levels that will cause harm to aquatic organisms. (WRIA-5)**

    Comment noted. Also see Response to Comment 29.

32. **A more aggressive stance should be taken with Boeing with regard to source control. Boeing is probably a historical and ongoing source of a lot of the PCBs that are in the river. (PC-22; PC-32; PC-40)**

    EPA and Ecology continue to evaluate historical and ongoing sources of PCBs to the river. Boeing facilities that may have been and/or may currently be sources of contamination are part of that evaluation.

33. **The storm drain pipes with stormwater from upland properties (The Boeing Company, Crowley Maritime, City of Seattle streets) should be re-routed so that they do not dump into Slip 4 where the cleanup is occurring. The pipes should be re-routed downstream where it is more fast flowing. Also, this would keep the area from being recontaminated and would give the salmon smolts a resting place from toxins and a place to adjust from fresh to saltwater. It is pointless to keep cleaning the same thing up over and over. (CC1-2)**

    The focus of the Source Control Strategy for the Lower Duwamish Waterway Site is to prevent recontamination of sediments to levels exceeding the Washington State Sediment Management Standards and the site-specific Lower Duwamish sediment cleanup goals. EPA and Ecology believe that the strategy will provide the framework and process for identifying source control issues and implementing effective controls, so that the Slip 4 area will not require additional cleanup in the future. Further, from an engineering and cost perspective, it is impracticable to move the locations and discharge points for these outfalls.

34. **Alternative 1 or 2 is better for fish. (CC1-1)**

    EPA agrees that Alternatives 1 and 2 provide a higher quantity and quality of habitat for salmonid species, with Alternative 1 providing slightly less habitat benefits. The Superfund Natural Resource Trustees have also indicated a preference for creation of intertidal elevations suitable for the development of high and low marsh habitat adjacent to low-slope mudflat (Steinhoff 2006). Addition of marsh habitat would fill a niche to increase productivity and serve

as a refuge for fish, particularly juvenile Chinook salmon (a threatened species under the Endangered Species Act).

35. Alternative 4 is the best method to clean up Slip 4. More toxic material would be removed and Crowley Maritime would still be a taxpayer on that property. My second choice is Alternative 3. (CC2-1)

EPA understands that some people prefer to permanently remove as much contamination from the environment as possible. However, based upon an alternatives analysis using Superfund criteria for removal actions (effectiveness, implementability, and cost), EPA believes that Alternative 2 gives us the best risk reduction in consideration of the advantages and limitations of each alternative and a balancing of trade-offs among alternatives. Alternative 2 is protective of people and the environment, meets legal requirements, is implementable, and is cost-effective.

Under Alternative 2, EPA will ensure that the surface sediments will not have any chemicals that pose unacceptable risk to people or the environment, and the cap will be designed to ensure that over time, people and animals are not exposed to the remaining buried contaminated sediments.

Compared to the other three alternatives, Alternative 4 includes removal of more contaminated sediments that are buried at depth. As set forth in EPA (2005) guidance, exposure and risk are related to contaminants that are accessible to animals (e.g., near the surface). Contaminants that are deeply buried, have no significant migration pathway to the surface, and are unlikely to be exposed in the future, may not need removal. Removal of these deeper sediments may not reduce risk. (Also see Response to Comment 19).

EPA has considered future uses of Slip 4 in developing the four cleanup alternatives. Since Crowley Marine Services owns the majority of the submerged land (sediments) within the Slip 4 Early Action Area, the cleanup alternatives were developed in consideration of Crowley's navigation uses on its property. Also see Response to Comment 36.

36. All of the contaminated sediment should be removed from Slip 4. All PCBs, wherever they exist, should be removed and destroyed. (PC-11; PC-17) After removing all of the contaminated sediment, it should be replaced with habitat and Crowley should not use the area because it is a depositional environment and would need to be dredged every so many years. (PC-16)

See Response to Comment 35. EPA does not believe that it is necessary to remove all of the contaminated sediment from Slip 4 because there are other reasonable alternatives that address the risk posed by these contaminated sediments.

EPA understands that some people prefer to permanently remove as much contamination from the environment as possible. In developing the removal alternatives in the EE/CA, consideration was given to a "maximum feasible removal" alternative, involving removal of most or all of the contaminated sediments within Slip 4 (see pp. 76-78 of the EE/CA). This approach would require extensive engineering measures, and the total cost would be estimated in the range of $15

to $20 million. Given site-specific considerations and limitations, the "maximum feasible removal" of all contaminated sediments would have greater short-term impacts during construction, and would have substantially greater incremental costs than other, equally protective, alternatives. The incremental cost of this approach is considered to be substantial and disproportionate to any benefits, and therefore, the "maximum feasible removal" approach was not carried forward to the analysis of alternatives.

37. Combine Alternatives 2 and 4 – purchase the land from Crowley, dredge all the contaminated sediments that can be feasibly removed so the cleanup is more permanent, create habitat and neighborhood restoration, and create public access. (PC-37; PC-39)

See Responses to Comments 35 and 36.

38. The EE/CA should reference the negotiations between the City and Crowley Marine Services for the purchase of Slip 4. (DRCC-10)

The EE/CA references negotiations between the City of Seattle and Crowley Marine Services in Section 5.

39. Determine whether the decline in surface sediment PCB concentrations is due to source control improvements or physical processes (p. 22 of the EE/CA). (DRCC-18)

EPA believes that the decline in surface sediment PCB concentrations that has been observed over the past 10 to 15 years is a result of both physical processes (sedimentation, dispersion, dilution, bioturbation) and source control improvements (e.g., reduction in PCB inputs). EPA does not believe that it is scientifically feasible, nor necessary, to calculate the percentages of the decline that are attributable to physical processes versus source control improvements.

40. Although we recognize that pre- and post-project monitoring of juvenile salmonid usage and general ecosystem health are not typically required for projects such as the Slip 4 cleanup, we encourage EPA to explore ways to invest in this type of monitoring as it may yield valuable information that will save money and improve the efficacy of future cleanup and habitat rehabilitation. (WRIA-4)

EPA does not anticipate requiring the City of Seattle and King County to perform monitoring of juvenile salmonid usage and general ecosystem health. The focus of long-term monitoring in Slip 4 will be on ensuring that the concentrations of sediment contaminants within the early action area are protective of human health and the environment. The development of the long-term monitoring plan, and the long-term monitoring results, will be shared with the public and stakeholders.

41. Habitat should be created up the flume. (PC-19)

The creation of habitat up the flume is beyond the scope of this Superfund project.

42. Salmon smolts should not be allowed to come into Slip 4 because they might pick up contamination from the outfalls that discharge to Slip 4. By creating habitat for smolts in Slip 4, the salmon are being encouraged to come into a place that might have contamination (i.e., from the ongoing discharges from the pipes at the head of Slip 4). (PC-20)

The habitat elements of Alternative 2 were developed in consideration of the preferred habitat types for salmonids that have been identified by the Superfund Natural Resource Trustees for the Duwamish Waterway. Marsh and mudflat habitats with high functional value in intertidal areas are particularly desirable.

EPA does not intend to restrict salmon access to Slip 4. EPA's goal is to ensure that the sediment cleanup in Slip 4 is protective of ecological receptors. As the lead agency for source control, Ecology's goal is to ensure that sources are controlled in a manner that is also protective of ecological receptors.

43. Boeing should pay for their fair share of the pollution they have caused in the Duwamish River. (CC3-1)

EPA agrees. To avoid cleanup delays for this project, the City and King County have agreed to fund the cleanup of Slip 4, while final cost allocation for the Slip 4 work is determined on a separate track. Also, Boeing is one of four parties implementing the Remedial Investigation/Feasibility Study (RI/FS) for the Lower Duwamish Waterway Site, and EPA will require that Boeing pay its fair share of whatever remedy EPA selects based on the RI/FS. Boeing is also implementing an EPA corrective action order addressing sources of contamination to the Lower Duwamish Waterway from Boeing's Plant 2 facility, and will be implementing source control measures at its other Lower Duwamish Waterway facilities under oversight by the Washington Department of Ecology.

44. As a maritime industrial user of the Duwamish River, Alternatives 3 and 4 are the best options to clean up Slip 4. Any limitation on the ability to use Slip 4 to its maximum advantage will have a much greater economic impact on our area for years to come over the increased cost of additional dredging. (Manson-1)

EPA has considered future uses of Slip 4 in developing the four cleanup alternatives. Since Crowley Marine Services owns the majority of the submerged land (sediments) within the Slip 4 Early Action Area, the cleanup alternatives were developed in consideration of Crowley's navigation uses on its land. Under Alternatives 3 and 4, historically permitted navigation depths would be re-established in the inner berth of Crowley's property. Under Alternatives 1 and 2, Crowley's potential use of a permitted berthing area in the inner portion of the slip would be limited; as compensation, the City of Seattle agreed to purchase the affected property from Crowley if this alternative were selected. Under each of the alternatives, the owner of the submerged lands would clearly have the ability to impact future use on its property.

Economic analyses regarding the effect of land use in Slip 4 on the broader economy are beyond the scope of this Superfund project.

45. Navigational use of Slip 4 is valuable, but salmon habitat and habitat anywhere along the river is extremely valuable. (PC-15)

Comment noted.

46. Why aren't we cleaning up the uppermost contaminated parts of the river, and then progressing down the river to avoid any recontamination? (Manson-2)

EPA agrees that it would seem logical to start early actions upstream and move systematically downstream. However, such an approach would potentially delay cleanup of the most highly contaminated locations for several years while we identify and control sources, and address less-contaminated upstream areas. EPA believes that sediment contamination in certain areas of the river is associated with greater ecological and/or human health risk, and that early cleanup of these more contaminated areas (regardless of their location along the river) will result in more immediate risk reduction to people and the environment. The rationale for identifying areas to be remediated on an expedited schedule is described in the report entitled "Identification of Candidate Sites for Early Action" developed for the site-wide Remedial Investigation report (Windward 2003). As importantly, EPA believes that during cleanup, best management practices and engineering measures can be implemented to minimize the potential for contaminated sediments moving outside the cleanup area.

47. Revise the EE/CA to include the recent NOAA study on PCBs in salmonids. (DRCC-17)

Salmonid data, including PCB tissue studies, are discussed in Section 2.1.8.2 of the EE/CA. EPA has requested that DRCC provide more details about the "recent NOAA study," as NOAA was not sure what study was being referenced in the comment.

48. Thank you for working with our community, and for listening to our input. (PC-33; PC-38)

Thank you for your input.

49. Thank you for your efforts in restoring the Duwamish River. (CC1-3; Manson-3)

Thank you for your input.

Errata for the EE/CA

During the public review process on the EE/CA, EPA identified the following errata for the EE/CA:

1. The Boeing outfalls that are referenced as 24 inch outfalls in the EE/CA are actually 30 inch outfalls.

2. Figure 2-8. For the historical core data (Landau 1990), Station SL4-10A includes a reference to surface concentrations of PCBs at "SL4-12A". This reference should be SL4-10A. Also, Station SL4-10A includes a reference to a carbon-normalized PCB concentration of "347.9" ppm-OC, and this value should be deleted – there are no PCB data for the 0-2 ft interval.

References

EPA. 1998. Assessment and Remediation of Contaminated Sediments (ARCS) Program. Guidance for In-Situ Subaqueous Capping of Contaminated Sediments. EPA 905-B96-004.

EPA. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA-540-R-05-012. OSWER 9355.0-85.

Steinhoff, Marla. 2006. Personal communication from Marla Steinhoff, NOAA, to Karen Keeley, EPA, dated March 6, 2006.

Windward. 2003. Task 5: Identification of Candidate Sites for Early Action. Technical Memorandum: Data Analysis and Candidate Site Identification. Final. Lower Duwamish Waterway Remedial Investigation. Submitted to the U.S. Environmental Protection Agency and Washington State Department of Ecology by the Lower Duwamish Waterway Group.

Attachment B-1

Sediment Disposal at Landfills[1]

When contaminated sediments are dredged from a cleanup site, they are disposed of at modern, closely regulated and monitored landfills. Two landfills that are commonly are Roosevelt Regional Landfill, located near Goldendale, WA in Klickitat County; and the Chemical Waste Management Landfill, located near Arlington, OR in Gilliam County.

Roosevelt Landfill is regulated by Klickitat County under a Solid Waste Handling Permit delegated from the EPA and the State Department of Ecology. A Department of Ecology air quality permit is in place to manage air emissions limits and air monitoring for the landfill. The County employs a full-time inspector who oversees landfill operations, and works to ensure that all permit requirements are fulfilled. Air emissions (including toxic air emissions) are monitored at the landfill under a Department of Ecology air quality permit. Roosevelt also has one of the largest landfill gas-to-energy generation plants in the region, providing a significant portion of Klickitat County's power.

Roosevelt Landfill cannot accept materials that are designated as Hazardous Waste or Dangerous Waste under state regulations. All materials taken by Roosevelt Landfill must pass strict testing to determine that they contain no inappropriate waste levels. Materials that do designate as Hazardous or Dangerous go to a landfill in Arlington, Oregon that is especially designed to accept and manage these materials (see below).

Sediments are usually delivered to the landfill by railcar, where they are tipped into trenches dug into existing landfill material, and then covered. One reason this is being done is because the landfill needs water, due to less than expected rainfall the last several seasons. Appropriate levels of water in the landfill assist with the biological breakdown of landfill material. Because the sediment dredge spoils are wet, they help make up the landfill water deficit. Trenching and covering the sediments helps retain this water.

The natural geology below the arid hills of Klickitat County creates an ideal location for the landfill including:

- 1,500 separation from the bottom of the landfill to the closest regional aquifer.
- The geology separating the landfill and this regional aquifer includes 340 feet of low permeability natural clay.
- Tests of the clay demonstrate performance at 10-8 cm/sec, meaning it would take approximately 15,000 years for water to move through this barrier.
- A small, local aquifer 100 feet below the surface is confined to the site and provides responsive groundwater monitoring.
- The site receives approximately 6-9 inches of precipitation a year.

Additional Engineering creates a secure site:

[1] This information was prepared by Rick Huey, Washington State Department of Ecology, and provided to Karen Keeley, U.S. EPA, on April 21, 2006.

- A secondary liner consisting of a two-foot thick, re-compacted natural clay layer (10-7cm/sec), or a performance based equivalent geosynthetic clay liner (GCL).
- A primary liner consisting of 80 mil high density flexible membrane liner (FML) which exceeds the regulatory prescribed 60 mil primary FML.
- A geotextile overlays the FML and is covered with highly permeable (greater than 10-2 cm/sec) aggregate for leachate collection.
- Comprehensive leachate and methane collection and control systems. Leachate is collected and recirculated into the landfill.
- An onsite power plant to convert the methane collected into electricity.
- A daily cover of approximately six inches of dirt or desiccated dredge spoils is used to cover materials in the landfill.

For further information:

- Tim Hopkins, Klickitat County Director of Solid Waste at TimH@co.klickitat.wa.us or 509-773-4448

- Kip Eagles, Department of Ecology Solid Waste Program at keag461@ecy.wa.gov or 509-575-2837

- http://www.rabanco.com/regional_landfill/default.aspx

- http://www.klickpud.com/power/lfg.asp

Chemical Waste Management Landfill (CWM), located near Arlington, OR is the only northwest region waste management disposal facility certified to accept Hazardous or Dangerous wastes, including Toxic Substance Control Act (TSCA) regulated waste with PCB concentrations greater than 50 parts per million.

Permitting and monitoring of CWM is delegated from the U.S. EPA to the Oregon State Department of Environmental Quality. The landfill is designed and operated under highly regulated and prescribed procedures, and is engineered to protect surface and ground water through the highest environmental control.

Factors that help with environmental protection at CWM include:

- A small, local aquifer 250 feet below the surface is confined to the site. Groundwater protection is monitored through the use of 64 monitoring wells.
- Tests demonstrate that it would take thousands of years to reach the uppermost aquifer is currently not pumped for groundwater use).
- The site receives approximately 8-10 inches of precipitation a year.

- There are 3 operating landfills. Two are double lined. The third has a lined tertiary sump and uses a series of geotextile liners along with soil/bentonite clay liners along the sides and bottom of the landfill.
- Because there are no liquids disposal or municipal waste, methane collection is not needed. Leachate is collected, treated in bulk liquid waste treatment system, then discharged to one of two surface impoundments.
- A daily cover in combination with sprayed water protects the integrity of the buried material and controls dust.

For further information from Oregon Department of Environmental Quality:

- Fredrick Moore, OR DEQ Permit Manager, Moore.Fredrick@deq.state.or.us or 541- 388-6146 extension 242.

- http://www.deq.state.or.us/wmc/solwaste/disposal.html

Chemical Waste Management Landfill homepage:

- http://www.wmnorthwest.com/landfill/landfillcities/chemicalwaste.html

CWM Education Resources (see documents for general landfill construction, operation and environmental information):

- http://www.wm.com/WM/community/Resources.asp?id=sub6

Attachment C

ARARs, Table 6-1

Engineering Evaluation/Cost Analysis
Slip 4 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

Table 6-1. Applicable or Relevant and Appropriate Requirements.

Source	Requirement
Washington State Model Toxics Control Act (WAC 173-340-440)	These regulations are applicable to establishing institutional controls for capping. Each alternative would comply with these requirements by implementing appropriate institutional controls in capped areas.
Federal Water Pollution Control Act/ Clean Water Act (CWA) (33 USC 1251-1376; 33 CFR 320-330; 40 CFR 230-231)	These regulations establish the basic structure for regulating discharges of pollutants into the waters of the United States. Section 404 regulates the discharge of dredged material or fill into navigable waters. Section 401 requires water quality certification for such activities. The implementing regulations of these laws are applicable to sediment dredging and capping actions. Each alternative would comply with these regulations through design elements to avoid or minimize adverse effects, the implementation of best management practices, and a water quality monitoring program.
Washington State Water Quality Standards for Surface Waters (WAC 173-201A)	Standards for the protection of surface water quality have been established in Washington State. Acute marine criteria are anticipated to be relevant and appropriate requirements for discharge to marine surface water during sediment dredging and capping. Each alternative would comply with these regulations through the implementation of best management practices and a water quality monitoring program.
Washington State Sediment Management Standards (WAC 173-204)	Chemical concentration and biological effects standards are established for Puget Sound sediments and are applicable to each alternative. For each alternative, chemical concentrations in surface sediment within the removal boundary will be below the SQS following construction.
Construction in State Waters, Hydraulic Code Rules (RCW 77.55; WAC 220-110)	Hydraulic code rules for construction projects in state waters have been established for the protection of fish and shellfish, and are applicable to Slip 4 construction activities. Each alternative would comply with the substantive requirements of these regulations by implementing best management practices for the protection of fish and shellfish, as recommended by the Washington Department of Fish and Wildlife.
Federal Endangered Species Act of 1973 (16 USC 1531 et seq.; 50 CFR 216-226; 50 CFR 402)	These regulations are applicable to any actions performed at this site as this area is potential habitat for threatened and/or endangered species. A biological assessment will be conducted in conjunction with the removal design documents in consultation with NOAA Fisheries and USFWS. Each alternative is expected to comply with the substantive requirements of the Act through design elements to avoid or minimize adverse effects, and implementing best management practices and conservation measures as recommended by NOAA Fisheries and USFWS.
Resource Conservation and Recovery Act [40 CFR 260 - 268]	Dredged/excavated material may be subject to RCRA regulations if it contained a listed waste, or if it displays a hazardous waste characteristic, for example by the Toxicity Characteristic Leaching Procedure (TCLP). RCRA regulations may potentially be ARARs for the storage, treatment, and disposal of the dredged/excavated material unless an exemption applies. Based on site-specific information, it is likely that none of the sediments or soils meet the RCRA definition of hazardous waste.

Table 6-1 (continued). Applicable or Relevant and Appropriate Requirements.

Source	Requirement
Toxic Substances Control Act (TSCA) (40 CFR 761)	This regulation is applicable to excavated or dredged materials containing PCBs. Each alternative would comply with TSCA by disposing all soils and sediments with total PCB concentrations greater than 50 mg/kg at a TSCA landfill. Disposal of soils and sediments with total PCB concentrations less than 50 mg/kg will follow the substantive requirements of 40 CFR 761.61, cleanup and disposal requirements for PCB remediation waste. Material meeting the definition of PCB remediation waste (761.3) would be disposed of using the three options under 761.61 (self-implementing option; performance-based option, and a risk-based option). The risk-based option under 761.61(c) would be expected to be selected at this site, and it may incorporate the requirements of the self-implementing option. If so, then PCB remediation wastes containing less than 50 mg/kg are allowed to be disposed of at non-TSCA municipal or solid waste landfills.
Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (50 CFR 600)	This act identifies and protects important habitats of federally managed marine and anadromous fish species. This act is relevant and appropriate to cleanup actions at Slip 4. EPA makes a determination about whether a proposed action may adversely affect EFH.
US Fish and Wildlife Coordination Act. (16 USC 661-667e)	This statute establishes criteria to protect fish and wildlife that could be affected by proposed or authorized federal projects involving "impounding, diverting, or controlling waters." This act is relevant and appropriate to cleanup actions at Slip 4. EPA will consult with the U.S. Fish and Wildlife Service and the Washington Department of Fish and Wildlife regarding the potential effects of the project on fish and wildlife and identify measures that would mitigate those impacts. Also, the statute requires that adequate provision be made for the conservation, maintenance, and management of fish and wildlife resources and their habitats. The ESA consultation described above will also satisfy the substantive requirements of the Fish and Wildlife Coordination Act.
Migratory Bird Treaty Act (16 USC 703-712)	Governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts and nests. This act is applicable to cleanup actions at Slip 4. Actions will be taken as needed to protect habitat for migratory birds, and avoid disturbances of their nests and eggs.
Rivers and Harbors Appropriations Act (33 USC 403; 33 CFR 320 - 323)	Section 10 of this act establishes permit requirements for activities that may obstruct or alter a navigable waterway. Activities that could impede navigation and commerce are prohibited. These substantive permit requirements are anticipated to be applicable to dredging and capping actions that may affect the navigable portions of the waterway. EPA will evaluate compliance with these regulations concurrently with their CWA 404 evaluation.

Table 6-1 (continued). Applicable or Relevant and Appropriate Requirements.

Source	Requirement
Washington Solid Waste Management Act (RCW 70.95) Solid Waste Handling Standards (WAC 173-350)	These regulations are applicable to the disposal of non-hazardous waste generated during remedial activities. These standards set minimum functional performance standards for the proper handling and disposal of solid waste, identifies functions necessary to assure effective solid waste handling programs at both the state and local level, and follows priorities for the management of solid waste. Because the disposal of the dredged sediments and debris will take place in a permitted solid waste landfill that is outside the site boundaries, both substantive and administrative requirements of applicable regulations must be met for this activity. The offsite rule (40 CFR 302.440) of the NCP requires that solid and hazardous waste offsite landfills to which CERCLA hazardous substances are being sent must be acceptable to EPA. The project specifications will require the contractor to obtain EPA approval of the proposed disposal facility. In practical terms, the requirements for disposal of dredged sediments will be found in the permit of the landfill that agrees to accept the waste. For example, the Roosevelt Regional Landfill's permit allows it to accept sediments that, while dewatered, do not need to pass the paint filter test (to limit free-draining liquids) before disposal.
Washington Dangerous Waste Regulations (WAC 173-303)	These state rules regulate the generation, handling, storage, and disposal of dangerous waste. Dredged material and debris would be evaluated for dangerous waste designation in accordance with these regulations. Because the disposal of the dredged sediments and debris will take place in a permitted solid waste landfill that is outside the site boundaries, both substantive and administrative requirements of applicable regulations must be met for this activity.
Executive Order for Floodplain Management (Executive Order 11988; 40 CFR Part 6, App. A) FEMA National Flood Insurance Program Regulations (44CFR 60.3 (d)(3))	Executive Order 11988 requires measures to reduce the risks of flood loss, minimize impact of floods, and restore and preserve the natural and beneficial values of floodplains. The NFIP regulations prohibit encroachments, including fill, within the adopted regulatory floodway unless engineering analyses demonstrate that the proposed encroachment would not increase flood levels. Each alternative meets the requirements of the Executive Order. EPA's sediment guidance document (USEPA 2005) states that although not ARARs, the Agency normally follows executive orders as a matter of policy. The dredge and fill activities in Slip 4 are outside the floodway limits, and therefore the net filling under Alternatives 1 and 2 is allowable under the NFIP regulations.
Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.; 43 CFR 10)	NAGPRA and implementing regulations are intended to protect Native American graves from desecration. These regulations are potentially applicable. Excavation or dredging must cease if Native American burials or cultural items are discovered.
American Indian Religious Freedom Act (42 USC 1996 et seq.)	These regulations are potentially applicable. Excavation or dredging must cease if Native American sacred religious sites, burials, or cultural items are discovered.

Table 6-1 (continued). Applicable or Relevant and Appropriate Requirements.

Source	Requirement
National Historic Preservation Act (16 USC 470f; 36 CFR 800)	These regulations are potentially applicable. If Native American or other cultural materials are discovered as part of the dredging or excavation, alternatives must be evaluated to avoid, minimize, or mitigate the impact.
Archaeological Resources Protection Act (16 USC 470 et seq.; 43 CFR 7)	These regulations are potentially applicable. Excavation or dredging must cease if archaeological resources are discovered.
Washington State Shoreline Management Act (RCW 90.58) Shoreline Management KCC Title 25	KCC Title 25 regulations implement the State Shoreline Management Act, and are applicable to all building, excavation, dredging, and filling within 200 feet of regulated shorelines. May require removal of illegal fill placed after 1972. Changes to the shoreline resulting from cleanup will be evaluated in design.
Critical Areas KCC Title 21A.24	State Law (the Growth Management Act) requires local governments to develop regulations to protect critical areas, but the content of these regulations is left to local government discretion – these ordinances are not subject to State approval. These will be addressed as To Be Considered for the Slip 4 CERCLA cleanup.